Effect of Entrepreneurial Orientation on Firm Performance and Failure: A Longitudinal Analysis

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A Thesis Submitted in Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Entrepreneurship at Durham University Business School

Durham University Business School

Durham University

United Kingdom

2017

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Abstract

This thesis aimed to examine the longitudinal effects of entrepreneurial orientation (EO) and each of its dimensions, innovativeness, proactiveness, and risk taking, on firm performance, among surviving and failed firms, as well as on the risk of firm failure. By utilising the theoretical framework of organisational learning theory and prospect theory, this thesis advances knowledge on EO by challenging the dominating EO-as-Advantage perspective.

This research adopted a quantitative methodology by objectively measuring EO at the firm-level and examining its effects along a longitudinal timeframe from the pre-crisis (fiscal year 2000) to the post-crisis period (fiscal year 2014). The thesis utilised secondary data from Compustat and CRSP databases to collect financial and market information on a sample of US large firms in the high-technology industry. The sample consisted of a total of 742 firms with 5,011 observations. Study 1 used fixed effect panel regression to examine the effect of EO and its dimensions on short-term and long-term measures of firm performance over time in the sample of surviving firms versus the sample of failed firms. Study 2 of this thesis examined the effect of EO and each of its dimensions on the risk of firm failure. The analysis of the data for Study 2 was done by the Cox proportional Hazard regression.

EO was shown to have an inverse U-shaped effect on performance among surviving firms and a negative effect on performance among failed firms. It was revealed that innovativeness had a significant positive effect on long-term performance; whereas proactiveness and risk taking had a significant negative effect on long-term performance. It was also shown that EO as well as its dimensions increased risk of failure over time. Such results provide evidence for the EO-as-Experimentation perspective and align with our predictions on EO from organisational learning theory and prospect theory.

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List of Abbreviations

EO	Entrepreneurial Orientation
ROA	Return on Assets
M&A	Merger and Acquisition
R&D	Resource and Development
RBV	Resource-based View
CATA	Computer Aided Text Analysis
OLS	Ordinary Least Squares
RSE	Robust Standard Errors
S.D.	Standard deviation
$R^{\wedge 2}$	R-squared
N.A.	Not Applicable
Min	Minimum
Max	Maximum
VIF	Variance Inflation Factor
Cox	Proportional Hazard Regression

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Dedication

To My Grandfather Dr. Fawzi Ghali and my Late Grandfather Osman Mohtaseb

Declaration

I, the author of this thesis, declare that this thesis is the result of my own work. The material contained in this thesis has not been formerly published nor submitted to any other institution. The copyright of this thesis shall remain with the author, hence acknowledgment related to any information derived from it should be noted. No quotation from it should be published without the author's prior written consent and information derived from it should be acknowledged.

Nazha Kamel Gali

Acknowledgements

First and foremost, I would like to thank God for giving me the strength to complete my thesis and for maintaining my spirit during times of hardships.

I would like to convey my deepest appreciation to my supervisor and PhD academic mentor, Prof. Mathew Hughes for his close supervision and guidance throughout my PhD journey. I learned so much under your supervision. You are an outstanding brilliant scholar with whom I would want to continue my future work. I truly thank you for always being there for me.

I am also grateful for my second supervisor Dr. Oliver Mallett for his continuous support and help.

I would especially like to thank my beloved partner, Omar Nasser Rahal for always pushing me to do my best and for believing in me.

Sincere thanks go to my mother who always supported me and helped me throughout my academic journey. I have always looked up to her as a child and hoped to be as half as accomplished as she is. I would also like to thank my father for giving me the opportunity to pursue my academic aspirations. I would also like to thank my grandparents and my brother Amr Gali for their support. I am very lucky to have such a supporting family and I will not take this for granted.

Last but not least, I would like to thank my best friend in Durham Dr. Stephanie Scott and my friends Xiaoxiao Ma, Halah Mohammad, and Adwoa Asantewaa for providing me with great support. I will always cherish our friendship.

Chapter 1

Introduction

1.1 Background

Entrepreneurial orientation (EO) is now considered to be the most central element of management science (Gupta & Dutta, 2016; Gupta & Gupta, 2015). The amount of scholarly work on EO is increasing and accelerating at a point to which research into the EO construct has overtaken the broader corporate entrepreneurship concept by some margin (Covin & Lumpkin, 2011). Basso et al. (2009) noted that EO is widely acknowledged as a "robust and rigorous scientific construct" since a cumulative body of knowledge continues to be developed. The increasing interest in EO has led to the construct to be a stabilised mature concept in the entrepreneurship literature and in the broader management literature (Gupta et al., 2016; Rauch et al., 2009; Wales, 2016). This profound interest in EO has rippled into journals outside of the entrepreneurship field and into policy-based research, since EO has significant outcomes not only at the firm-level but also at the macro-economic level by impacting economic growth (e.g. Mthanti & Ojah, 2017).

EO is an essential part of corporate entrepreneurship strategy. EO is manifested as an entrepreneurial process or behaviour within an organisation (Ireland et al., 2009). The literature generally acknowledges and accepts the initial conceptualisation of EO as a firm-level behaviour (Lumpkin & Dess, 1996; Miller, 1983) and that such behaviours are sustained over time (Covin & Slevin, 1991; Miller, 2011). It is this sustained characteristic of EO, which manifests EO as an organisational behavioural state and not an "anomaly" (Ireland et al., 2009; Wales, 2016). A firm that exhibits a high level of EO indicates that they are likely to be pioneers in their industry and willing to experiment with new forms of knowledge assets to explore new avenues for growth (Mthanti & Ojah, 2017; Wales, 2016). Thereby, highly entrepreneurial firms are more likely to embrace change and proactively respond to changes in the external market (Miller, 2011).

The strategic management literature has centred upon the importance of EO in achieving higher performance (e.g. Anderson et al., 2015; Wiklund & Shepherd, 2003, 2005). Several authors, following the Rauch et al. (2009) meta-analysis, have considered that EO is vital for enhancing a firm's performance in the short-run (Andersén, 2017). Yet, the outcomes are less known and straightforward when examining the effect of EO over time. Only recently, it has been shown that the positive effect of EO decreases over time (Gupta & Gupta, 2015). Most importantly, the definitional conceptualisation of EO places an emphasis on sustained recurring entrepreneurial behaviours (Covin & Slevin, 1991). This indicates it is essential to capture the longitudinal effect of EO over time rather than focus on a short-term assessment of the value of EO (Gupta & Gupta, 2015). One cannot conclude that EO leads to a sustained competitive advantage if its outcomes are not examined in the long-run (Covin & Miller, 2014). Sustaining entrepreneurial behaviours over a significant period is likely to produce more variation in the outcomes of EO than if assessed in the short-term (Wales, 2016).

Firms that are high in EO, are essentially engaging in more exploratory innovative, proactive, and risk-taking behaviours, which would increase the variance in the distribution of the outcomes originating from it, with certain behaviours leading to a successful outcome and others conversely leading to losses (Wiklund & Shepherd, 2011). This inherent risk associated within EO is not captured in the literature, since most of the research has considered EO to be directly linked to an increase in firm performance (Rauch et al., 2009) and shareholder value (Shahzad et al., 2016). Thus, the accepted view among researchers is that the primary goal of EO is to enhance the firm's financial outcomes (Rauch et al., 2009). To come to this conclusion is premature as an increase in risky explorative endeavours is bound to lead to uncertain outcomes, according to organisational learning theory (March, 1991). Even though exploratory entrepreneurial behaviours eliminate the myopia of exploitative adaptive processes (Hughes et al., 2007), such an increase in exploration increases the variance in possible outcomes. Thereby, the variance-producing nature of EO raises the possibility that variation would lead to costly errors. Over time, there is a high(er) probability that exploration would put precedence on foolish experimentation over efficiency and reliability (March, 2006), a problem also known as the failure trap (Levinthal & March, 1993).

The EO literature has become stagnant in terms of developing new measures of EO (Gupta & Dutta, 2016) that would revitalise the EO research and challenge the dominating EO-as-Advantage perspective (described above). The latter, which has been the majority of the stance of research on the EO-firm performance relationship, considers that it is almost-inherently beneficial for firms to pursue EO (Wiklund & Shepherd, 2011). The new lens of examining the outcomes from EO, termed the

EO-as-Experimentation perspective, considers that EO would promote variability among firm-level outcomes due to the higher association of EO with experimentation (Wiklund & Shepherd, 2011). A study, by Mthanti and Urban (2014), has shown that experimentation is highly related with EO. They found that firms that highly experiment and invest in new technologies to yield new products are more likely to have higher EO levels. This experimentation inherent within EO would lead to more variation in its outcomes. Thus, based on the EO-as-Experimentation perspective, EO might lead to higher rates of failure among failed firms even though it enhances the relative firm performance among surviving firms (Wiklund & Shepherd, 2011).

Interestingly, following the Rauch et al. (2009) meta-analysis, most of the studies have accepted that EO as a gestalt construct enhances firm performance without considering essentially that EO leads to a higher performance variance and higher failure (Wiklund & Shepherd, 2011). This problem is likely to be exacerbated by the passage of time. Furthermore, the gestalt conceptualisation of EO has become the dominant stance in the literature. Even though the EO dimensions have been shown to have differential effects on a firm's performance (e.g. Hughes & Morgan, 2007; Kreiser et al., 2013; Shahzad et al., 2016), researchers either bundle the different EO dimensions into a gestalt construct (Eshima & Anderson, 2017; Mthanti & Ojah, 2017) or examine the shared effects among the EO dimensions (Lomberg et al., 2017).

The above analysis indicates that there is insufficient evidence and consideration for the possible outcomes of EO on the risk of firm failure, which necessitated the need for this thesis.

This chapter is structured as follows: the upcoming section will outline a detailed discussion of the gaps in the literature, the motivation for conducting this research, followed by the aims and objectives of this research, the research's significance and purpose in terms of its theoretical contribution. Then, sections covering a synopsis of the methodology used and the significant findings of this thesis will be outlined. Lastly, the chapter will provide a summary of the contents of the upcoming chapters of the thesis.

1.2 Literature Gaps

First, the literature has been limited by a survivor or a sample selection bias (Rauch et al., 2009; Wales, 2016). Our research has argued for and has shown that the literature has been biased towards examining the EO and firm performance relationship among a sample of surviving firms. The sole focus on a sample of surviving firms has originated from the initial works by Zahra and Covin (1995) and Wiklund (1999), in which the authors excluded firms from their study if they underwent a merger or acquisition or bankruptcy. This is alarming as it has paved the way for subsequent authors (Lomberg et al., 2017; Rauch et al., 2009; Wiklund & Shepherd, 2003, 2005) to neglect the examination of the possible effects of EO on firm-level outcomes among a sample of failed firms. Since EO is associated with experimentation and engaging in behaviours of proactive discovery, innovative or trial-and-error experimentation, and risk-taking, this could entail that EO might lead to a financial loss (Wiklund & Shepherd, 2011). Thereby, it is surprising that previous authors have disregarded the examination of the effect of EO on firm performance among failed firms. Considerably, EO represents a construct of inquiry that has reached a mature stage, which has been saturated in iterating the same logic, replicating the same methods, and arriving at similar conclusions to satisfy the EO researchers' groupthink enigma of self-fulfilling fallacies (Gupta & Dutta, 2016).

Second, the literature has been biased by a conceptualisation-measurement misalignment. Most of the literature has captured and measured EO at the managerial level by utilising the widely known Miller (1983)/Covin and Slevin (1989) scale, which has received strong empirical support (Covin & Miller, 2014). This EO scale or alternative versions of it are administered to top managers or senior executives. This reveals that EO researchers are measuring EO by top managerial opinions or dispositions towards EO. However, EO has been conceptualised as firm-level behaviours, specifically behaviours of innovativeness, proactiveness, and risk-taking (Miller, 1983). Essentially, it is such behaviours and actions of the firm that imply an entrepreneurially oriented firm (Covin & Slevin, 1991). A disposition towards entrepreneurial behaviours does not necessarily translate *into* real, actual entrepreneurial behaviours because there are certain constraints on the managerial tendency towards entrepreneurial behaviours such as low managerial discretion (Gupta et al., 2016). Managerial discretion is considered as the leeway or an absence of constraint that allows top managers to enact their desires for the firm (Hambrick & Finkelstein, 1987). Thereby, this constitutes a conceptualisation-measurement misalignment problem, in which most authors claim to conceptualise EO as firm-level behaviour and commonly measure EO by gathering self-reported data using the EO scales. Such EO scales do not capture the firm-level behaviour but reflect managerial tendencies and beliefs towards entrepreneurial behaviours (Covin & Lumpkin, 2011). Furthermore, there is an inherent limitation in the form of single informant problem by utilising the EO scales (Wales, 2016).

Third, the literature has been biased by a cross-sectional study design limitation. Essentially, the time effect of EO has been mostly disregarded until recently (Gupta & Gupta, 2015; Gupta et al., 2016). Most of the literature on EO has been in the form of cross-sectional studies that examine EO at one point in time by utilising the EO scales (e.g. Lomberg et al., 2017; Rauch et al., 2009). Such studies do not capture the effect of EO over time, yet an essential aspect of entrepreneurial behaviours is that they must be consistently and recurrently exhibited over time (Covin & Slevin, 1991). Thus, temporal stability, the defining characteristic of EO (Anderson et al., 2015), is not being addressed in the literature.

Fourth, previous work has been biased by solely testing the value of EO on aggregate performance or short-term measures of firm performance (e.g. profitability) that do not exclusively reveal the effect of EO in the long run (Gupta & Gupta, 2015; Gupta & Wales, 2017). This has resulted in a general consensus in the literature that EO enhances firm performance, yet it is not theoretically known what outcomes would arise from examining EO and each of its dimensions against different performance indicators (e.g. Rauch et al., 2009). EO represents consistent and recurrent behaviours and as such is a long-term orientation whose value must be tested over time on measures that reflect the long-term performance or even viability of a business. More so, firm performance is a multi-faced phenomenon, in which various performance indicators represent different dimensions of firm performance (Gupta & Wales, 2017). Thus, testing EO against one performance indicator or an aggregate index would obscure the unique firm outcomes from EO.

Lastly, the gestalt conceptualisation of EO has been predominant in the literature (e.g. Eshima & Anderson, 2017), in which researchers consider EO to be the joint exhibition of its dimensions, even though the EO dimensions have been shown to exhibit varying effects (e.g. Hughes & Morgan, 2007; Karmann et al., 2016). By aggregating the independent dimensions into an EO index, it would conceal the independent effects of each of the EO dimensions. Theoretically speaking, the EO dimensions might exhibit different performance effects among themselves and even when tested on several performance indicators. As George and Marino (2011) stated, examining the lower order EO dimensions rather than the higher order EO construct would provide theoretical insights. Astonishingly, researchers continue to adopt the more widely accepted gestalt conceptualisation of EO (e.g. Gupta et al., 2016). Instead, by considering the unique effects of each of the EO dimensions then firms can obtain the optimal mix of the EO dimensions, which are required to enhance a firm's performance (Hughes et al., 2007).

After considering the problems in the literature, the next section will outline the motivation for conducting this research.

1.3 Motivation for Research

The motivation behind this thesis stemmed from the critical issues that have undermined our understanding of the effect of EO on firm-level outcomes. Given that EO has originated from the strategy research, it is understandable that EO and the firm performance relationship has dominated EO research (Rauch et al., 2009). This stems from Covin and Slevin (1991) consideration that firm performance is the ultimate and most relevant dependent variable when examining the outcomes from EO. Thus, it is crucial to examine the outcomes from EO in terms of its value on an organisation's performance as well as on long-term survival (Gupta & Wales, 2017).

Even though the theoretical underpinnings of the EO and firm performance relationship have not been explicitly and robustly theorised, most researchers assume a priori that EO would enhance firm performance and in turn promote firm survival (Wales, 2016). This is a largely important issue as three decades of EO research have hinged on the assumption that EO produces beneficial outcomes

(Gupta & Wales, 2017). Thereby, the causal mechanism underlying the EO and firm performance relationship is assumed rather than tested (Wiklund & Shepherd, 2011). The EO-as-Experimentation perspective can provide a fine-grained in-depth examination of the possible outcomes of EO on several firm-level outcomes (Wiklund & Shepherd, 2011). Unfortunately, only few studies have examined EO from the EO-as-Experimentation perspective. Only one study, following the Wiklund and Shepherd (2011) study, used insights from the EO-as-Experimentation perspective to theorise that EO enhances the variability in innovation outcomes, and that realised absorptive capacity is needed for ensuring that EO would lead to enhanced firm performance (Patel et al., 2015). Furthermore, few researchers have examined the outcomes of EO in a representative sample of surviving and failed firms (Wiklund & Shepherd, 2011). Only one study recently has found that EO negatively moderates the family involvement and risk of failure relationship (Revilla et al., 2016). Such findings challenge the EO-as-Advantage perspective and corroborate the EO-as-Experimentation perspective.

Most research currently still aligns with the resource-based view of EO and the dynamic capability perspective (Covin & Miller, 2014). Recent researchers consider that EO should move away from the perspective that it involves only exploratory behaviours (Eshima & Anderson, 2017). Yet, EO is not a resource orientation, but an inherent risky strategic behaviour, which could lead to uncertain outcomes (Wiklund & Shepherd, 2011). To assume and clearly state that EO firms grow faster (e.g. Eshima & Anderson, 2017) would be to ignore its risky double-edged nature.

Recent research continues to only examine the outcomes of EO among a sample of surviving firms and conclude that EO is universally beneficial for firms (Wales, 2016). The consistent findings in the EO literature on the EO-as-Advantage perspective is due to the popularity of using responses of managers to reflect entrepreneurial orientation (Eshima & Anderson, 2017). This limited approach introduces self-response bias and subjectivity bias (Mthanti & Ojah, 2017). Thereby, EO has been grounded in upper echelon theory, which considers that firm-level behaviour to be a reflection of managerial sensing for opportunity recognition (Hambrick & Mason, 1984). However, a managerial or individualistic attribute cannot be given to an originally firm-level conception (Miller, 1983).

This thesis moved away from the dominance of upper echelon logic and the resource-based view to theorise the outcomes of EO in a homogenous sample of surviving and failed firms in the high-technology industry using insights from organisational learning theory (a theory of firm-level experimentation and exploration). By using organisational learning theory as the backbone of this thesis, the dominating positive feature of EO could be challenged (Gupta & Dutta, 2016).

The next section will outline the aims and objectives of this research along with the main research questions of this thesis.

1.4 Aims, Objectives, and Research Questions

The main aim of this thesis was to examine the causal effect of the entrepreneurial orientation of a firm on several performance indicators as well as on the risk of failure in a sample of surviving and failed firms over time. It also examined the different effects of each of the EO dimensions (innovativeness, proactiveness, and risk-taking) on firm performance and probability of failure. The thesis was separated into Study 1 and Study 2: Study 1 focused on the effect of EO/EO dimensions on firm performance measures among the sample of surviving versus failed firms. Study 2 examined the effect of EO and each of its dimensions on the risk of firm failure.

To achieve these aims, the thesis addressed the following main objectives. Firstly, to explore the overall impact of EO as well as the separate influences of each of its dimensions on short-term and long-term performance from the pre-crisis (the fiscal year[1] 2000) to the post-crisis period (the fiscal year 2014) in a sample of large US surviving firms versus failed firms in the high-technology industry. Secondly, to explore the impact of EO and its separate dimensions on the probability of firm failure among the same sample of surviving and failed firms.

The thesis aimed to answer the following essential research questions for Study 1 and Study 2 respectively:

[1] fiscal year means that it is a yearly period, at the end of which the company's financial records close and may not necessarily be the same as a calender year

(1) What are the effects of EO/separate effects of each of the EO dimensions on firm performance in separate samples of surviving and failed firms?

(2) What are the effects of EO and its dimensions on firm failure?

This thesis addressed the research questions by: (1) examining the longitudinal effects of EO and each of its dimensions on various firm performance measures in a sample of firms that survived, (2) examining the effects of EO and its dimensions on firm performance among firms that did not survive, and (3) studying the effects of EO/its dimensions on the risk of firm failure using insights from the EO-as-Experimentation perspective (Wiklund & Shepherd, 2011).

To enable the separate examination of outcomes from each dimension of EO, this thesis deconstructed and unraveled the latent EO construct into its three main components of innovativeness, proactiveness, and risk-taking. The measures of each of the EO dimensions were constructed using objective proxies in response to the recommendation by Miller (2011). The separate effect of each of these dimensions was examined on short-term and long-term firm performance utilising a longitudinal panel dataset (Lumpkin et al., 2010). Panel data analysis is more reliable than a cross-sectional snapshot examination (Hsiao, 2014). Few researchers have considered the panel effect of EO on firm value over time (e.g. Gupta & Gupta, 2015; Gupta et al., 2016). Most of the research has been in the form of cross-sectional studies which focus on accounting measures of firm performance (Gupta et al., 2016; Miller, 2011). The use of the panel data would address issues of reverse causality, endogeneity, and heterogeneity (Mthanti & Ojah, 2017; Miller, 2011). Thus, similar to few researchers (e.g. Miller & Le Breton-Miller, 2011; Short et al., 2010), this study examined the effect of EO on a long-term valuation forward-looking indicator (in the form of Tobin’s Q). Although, the main measure in this study is Tobin’s Q, an accounting measure of firm performance (Return on Assets) was included as well in order to have a multi-dimensional aspect of firm performance (Gupta & Wales, 2017; Rauch et al., 2009).

The context of the study, which covered the pre-crisis (the fiscal year 2000) to the post-crisis (the fiscal year 2014) period, is informative as the context of the study would bring insights into the effects of EO (Zahra & Wright, 2011). The panel form of the thesis comprised a significant historical event (the financial crisis), which has witnessed several firm failures (e.g. Revilla et al., 2016). Researchers have largely ignored the consideration of the effect of EO on firm-level outcomes among a sample of failed firms and have continued to over-emphasise the performance-enhancing effects of EO among samples that include only surviving firms (Rauch et al., 2009). By focusing on a sample of high-technology firms, then context-sensitive insights into the EO and firm performance relationship can be made (Miller, 2011). Most of the literature on EO has been in the context of heterogeneous samples (Wales, 2016). Even though examining the EO-firm performance relationship in a heterogeneous sample would provide more generalisability for the results, this would come at the expense of context-specific revelations. Even more so, every industry differs in its approach and driving force for engaging in EO and this heterogeneity would jeopardise realising and capturing the risks generated from EO (Wiklund & Shepherd, 2011). Particularly in the high-technology industry, this downside nature or experimentation inherent within EO can lead to a suboptimal outcome or even failure (Patel et al., 2015).

This research was the first to address the risks associated with EO and to test the over-arching bias of the positive outcomes of EO. The recent paper by Gupta and Dutta (2016) pointed out the lack of criticism or critique of the positive stance on the EO-firm performance relationship and this paper is in effect a significant breakthrough in the EO literature on the double-edged sword nature of EO. By using insights from the EO-as-Experimentation perspective and repositioning EO at the firm-level, the EO literature would be advanced.

The next section will outline the research significance and purpose in terms of its theoretical contribution to the literature.

1.5 Theoretical Foundation

The significance of this thesis was that it addressed a problem that has been largely ignored in the EO scholarly research, which is the effect of EO on firm survival/failure. Most of the studies in the literature examine the effects of EO among a sample of surviving firms only (e.g. Rauch et al., 2009). In turn, there has been almost a tacit denial of the problems posed by EO in the face of the hegemony of the EO-as-Advantage perspective, as evidenced by the survival bias that plagues the study of EO.

Previous studies on the effects of EO coincide with the EO-as-Advantage perspective, which is derived from the resource-based view of the firm (Wiklund & Shepherd, 2011). The resource-based view considers that EO is a valuable and rare resource and enables firms to earn superior performance (Barney, 1991; Barney et al., 2001). While such a theory considers EO as an intangible knowledge-based resource, which is important for a firm's continued survival, the causal mechanisms of the effects of EO on firm performance are not clearly understood and are rather assumed in the literature (Wiklund & Shepherd, 2011). The EO-as-Advantage perspective considers that EO, as a rare and inimitable resource or capability, would lead to a sustained competitive advantage (Patel et al., 2015). Thereby, based on the EO-as-Advantage perspective, most researchers agree that EO has a positive effect on firm performance. Moreover, the EO-as-Advantage perspective considers that since EO leads to a sustained competitive advantage over time, it enhances firm survival (Rauch et al., 2009; Wiklund & Shepherd, 2011). This argument requires a longitudinal study, yet this is absent from the EO research (Gupta & Gupta, 2015).

On the other hand, the EO-as-Experimentation perspective, which is derived from organisational learning theory, considers that EO more likely involves exploratory learning activities that may be far from the firm's competencies. Thus, EO might lead to either a successful outcome or a loss (Levinthal & March, 1993; March, 1991). In this sense, even though EO might have a positive effect on the relative performance of surviving firms, it might lead to a higher risk of being in financial distress (Wiklund & Shepherd, 2011). Prospect theory has great potential in revealing the risks associated with EO and its potential downside. That is, prospect theory considers that firms choose to engage in behaviours based on their reference point (Kahneman & Tversky, 2000), and thus perceive an outcome either as a gain or a loss based on their performance relative to their reference point (Swift, 2016). Surviving firms, that are in the gain domain, are likely to be more risk-averse in comparison to financially distressed firms in the loss domain. This means that firms that are suffering from losses are more likely to be more risk taking and engaging in experimentation (i.e. entrepreneurial behaviours), but it is this search for exploratory endeavours that leads to a higher risk of experiencing failure (Levinthal & March, 1993; March, 2006). Thereby, according to organisational learning, it was theorised that EO has a positive relationship with the risk of failure and prospect theory emphasises that financial distressed firms are more likely to engage in EO. By engaging more in EO, this leads to the outcome of failure.

This thesis contributed to theory and the body of knowledge on EO by using the theoretical lens of organisational learning theory and prospect theory, which have been mostly disregarded in the EO literature. In fact, there are only two research papers using organisational learning theory to theorise outcomes from EO (Patel et al., 2015; Wiklund & Shepherd, 2011).

Wiklund and Shepherd (2011) theorised based on organisational learning theory that EO increases variation in firm-level outcomes, increasing chances of success and failure. Yet, no research followed upon their theoretical development in the EO literature. Furthermore, Wiklund and Shepherd (2011) called for identifying new dependent variables to assess the value of EO, yet no research has followed upon their suggestion. Recently, Gupta and Wales (2017) indicated that researchers have now accepted the undisputed revelation that EO enhances firm performance (Covin et al., 2006; Rauch et al., 2009), yet most of the research considers either a short-term measure or a hybrid measure of performance. In this respect, what constitutes the performance hybrid index is rather arbitrary, and it is not known what is being captured (or not) within the dependent variable index (Gupta & Wales, 2017).

Most importantly theorising outcomes from EO must come from a specific outcome and within a particular context. If EO is considered as an exploratory orientation, then a clear target is not growth or performance, but more likely the risk of failure (Gupta & Wales, 2017). It is not surprising then that slightly more than half of the research conducted on EO includes ‘theor’ in its text since EO is not commonly tested in a particular context and against a specific firm-level outcome for researchers to ensure the generalisation of their research results (Wales, 2016). Using a heterogenous sample of firms to test the overall effect of EO on an aggregate performance index would not theoretically advance our understanding of EO or even lead to deeper and more relevant and meaningful insights.

Organisational learning theory has been utilised in the literature to examine the effect of relative exploratory orientations on the risk of firm failure (Swift, 2016; Uotila et al., 2009). This reveals that insights into the effect of EO on the risk of firm failure is made possible within the theoretical foundation of organisational learning theory. Moreover, no research paper on the EO-firm performance relationship uses insights from prospect theory (e.g. Swift, 2016). Prospect theory reveals the double-edged nature of EO by theorising that firms that are financially distressed would engage more in EO and this increasing focus on EO would eventually lead to their failure.

This research is groundbreaking as it revealed, through drawing theoretical arguments from organisational theory and prospect theory, that EO as a firm-level behaviour is an increasingly risky orientation with its possibility to enhance a firm's failure. No previous research has examined the longitudinal effect of EO on the probability of failure over time. This is alarming as the inherent destructive nature of experimentation of EO is largely ignored in the literature. A recent review of the most common theoretical frameworks used in the EO literature do not include organisational theory or prospect theory (Wales, 2016). Of the most commonly used theoretical perspectives are the resource-based view, organisational change, and network theory (Wales, 2016). By using instead organisational learning theory and prospect theory to theorise outcomes from EO on its downside risk, then our knowledge on EO would be advanced. The next paragraphs will outline an overview of the hypothesised effects from EO and its dimensions.

Organisational learning theory distinguishes between exploratory and exploitative endeavours; exploratory behaviours are riskier and lead to higher uncertainty (March, 1991). Firms that are increasingly explorative at the expense of exploitative would more likely face a higher risk of lower performance outcome (March, 2006; Swift, 2016). The EO-as-Experimentation perspective considers that EO would enhance the performance of surviving firms. On the contrary we posited, according to organisational learning theory, that surviving firms that are highly entrepreneurial would have lower performance. Thus, it was expected that EO would have an inverse U-shaped effect on firm performance among the sample of surviving firms. Furthermore, we considered that EO would lead to a higher rate of failure (Wiklund & Shepherd, 2011).

This thesis not only examined the overall effect of EO, but also the separate effects of each of the EO dimensions. Most of the literature has disregarded the independent and individual effects of the EO dimensions (Wales, 2016). This gestalt conceptualisation of EO and hybrid measurement of firm performance has led researchers to prematurely conclude that EO is beneficial to a firm's performance. It is thereby important to break away from this dominant gestalt conceptualisation of EO and the value of EO through the dependent variable firm performance, which produce results that coincide with the EO-as-Advantage perspective. Firstly, this thesis posited, according to organisational learning theory, that although being innovative (as an exploratory dimension of EO) is resource-intensive in the short-run (Li & Atuahene-Gima, 2001), it would lead to long-term benefits for firms (Roberts & Amit, 2003). Furthermore, we predicted that innovativeness would decrease the risk of firm failure, as it has been shown that innovative firms have better survival than non-innovative firms (Cefis & Marsili, 2005).

Even though proactiveness has been shown to have a positive effect on performance (Rauch et al., 2009), recent evidence has revealed that being proactive might not benefit firms. Specifically, Karapandza (2016) performed textual analysis on 10k annual reports of firms from 1993 until 2014 and revealed that firms which use future tense language in their annual reports generate fewer stock returns. Thereby, this thesis hypothesised that being proactive is not beneficial for a firm, in which firms that operate in aggressive competitive markets must invest in market opportunities to remain viable. Taking long-term forecasted gambles by re-investing in the business would not pay off in a highly competitive environment such as the high-technology industry (Patel et al., 2015). The reason that possibly proactiveness has been shown to have a positive effect on a firm's performance is that it has been assessed against short-term metrics in the literature (Lumpkin & Dess, 2001). Thus, we predicted that proactiveness will cause diminishing returns in the long-run and would have a positive effect on a firm's failure.

According to organisational learning theory, risk-taking is associated with uncertain outcomes and might eventually lead to a higher probability of failure (Wiklund & Shepherd, 2011). When a firm is involved in risky behaviours, then it essentially tolerates a probability of failure due to high costs of taking risks (Wiklund & Shepherd, 2005). High levels of risk taking are likely to be counter-productive for firms (Rauch et al., 2009). Risk-taking has been shown to have a negative effect on a business's performance (Hughes & Morgan, 2007; Kreiser et al., 2013; Short et al., 2010). Thereby, it was hypothesised that risk-taking leads to an increase in the hazard of failure and has a negative effect on the long-term performance.

In summary, this thesis advanced the knowledge on EO and each of its dimensions by considering their longitudinal effect on separate firm-level outcomes (performance as well as risk of failure) among a sample of high-technology firms, and developed its theoretical underpinnings from organisational learning theory and prospect theory. This thesis extended upon the EO-as-Experimentation perspective to examine the potential downsides associated with EO. No researcher followed upon the EO-as-Experimentation perspective (Wiklund & Shepherd, 2011) to test the risk of failure from a sole focus on an entrepreneurial orientation.

As a last note, this research does not imply that engaging in more entrepreneurial behaviours is ill-advised for firms, but that firms must be able to manage the double-edged nature of EO and its variance producing capability (Patel et al., 2015; Swift, 2016). By managing the exploratory nature of EO, firms are then able to distinguish between bad exploratory entrepreneurial endeavours and successful endeavours. This would then potentially limit the uncertainty and risks inherent within EO (Swift, 2016). The aim of this thesis was to advance knowledge on the longitudinal effect of EO by revealing that EO might be aligned more with the EO-as-Experimentation perspective. This means that engaging in more entrepreneurial behaviours and a sole focus on EO over time might enhance the risk of firm failure. This downside nature of EO can be revealed through the theoretical framework of organisational learning theory and prospect theory.

The next section will consider some concerns pertaining to the methodology.

1.6 Synopsis of Methodology

The following thesis examined the causal effect of EO as well as each of the EO dimensions from the pre-crisis to the post-crisis period along a 15-year timeframe on a firm's financial performance and risk of failure. The thesis used panel regression analysis for Study 1 and survival analysis for Study 2. The sample consisted of large (more than 500 employees) US surviving and failed firms in the high-technology industry. The dataset was a longitudinal panel of 742 firms comprising in total 5,011 observations.

The methodology used to examine the effect of EO and each of its dimensions on firm performance measures was a panel fixed effect regression. A fixed effect regression would control for variables that are fixed over time and capture the heterogeneity in the data, which makes it far more superior to a pooled OLS (ordinary least squares) regression (Wooldridge, 2015). For examining the effect of EO and each of its dimensions on the risk of firm failure, the proportional hazard regression model was used.

To measure each of the regressors (EO and its dimensions) and the dependent variables (firm performance measures) objective proxies were used. The objective measurement surpasses the common method of subjective managerial responses, which is limited due to self-response managerial, subjectivity, and cross-sectional biases (Mthanti & Ojah, 2017). Furthermore, to capture the multi-dimensional conceptualisation of EO (Lumpkin and Dess, 1996), it is important to develop alternative measurements to the EO scale. The latter was conceived by Miller (1983) and Covin and Slevin (1989) to represent the gestalt view of EO. In this thesis, EO is captured by using objective measures since the initial EO scale was not conceived to capture the multi-dimensional conceptualisation of Lumpkin and Dess (1996) (Wales, 2016).

Many previous researchers have used proxies for the investigation of management and strategic phenomena (Engelen et al., 2015; Miller & Le Breton-Miller, 2011). Proxies are considered archival measures to represent theoretical constructs (Ketchen et al., 2013). Researchers, especially in the fields of accounting, and finance have long focused on developing proxies for secondary data measures (Hribar & Yang, 2015; Malmendier & Tate, 2005).

There is a recurring call in the EO literature to develop new measures of EO, however few researchers have answered this call (George & Marino, 2011; Lyon et al., 2000). This is in no small part due to the dominance of the Miller/Covin and

Slevin scales and the complexity of developing new measures (Covin & Wales, 2012). The Covin and Slevin EO scale (1989) has been widely used in the literature to examine the EO-performance relationship (Rauch et al., 2009). However, such a summated scale combines the three dimensions of EO into a single construct, which might disregard the independent impact of each dimension on firm performance (Hughes & Morgan, 2007; Lumpkin & Dess, 1996). This was postulated by Lumpkin and Dess (1996) who suggested that the dimensions of EO might influence firm performance differently. Later, Hughes and Morgan (2007) showed that the dimensions of EO had contrasting effects on firm performance and might be context specific (Wales, 2016; Wiklund & Shepherd, 2011). Thereby, a scale that combines the three dimensions into a single construct might generate misleading interpretations and cause researchers to consider that such an independence between the EO dimensions does not exist (Kreiser et al., 2002; e.g. Lomberg et al., 2017). The popularity of such a scale has discouraged researchers from developing new measures of EO (Covin & Lumpkin, 2011).

More recently, and since Lyon's et al. (2000) call, few researchers have started to use alternative methods to measure EO by using content analysis (Gupta et al., 2016; Short et al., 2010) or developing proxies for the EO dimensions (Miller & Le Breton-Miller, 2011; Shahzad et al., 2016). As such secondary data, which is more advantageous, was used to capture EO, since it avoids the aforementioned biases of a survey methodology (Lyon et al., 2000).

1.7 Structure of the Thesis

The following section represents the structure of the chapters and will outline the organisation of the forthcoming chapters and the contents of each chapter. The thesis is divided into 11 chapters as follows:

Chapter 2 discusses the main construct EO, which was examined. It will reveal the definitions, dimensions, as well as the distinct phases of EO in the literature and highlight the gaps and importance of this thesis in addressing those gaps. Most importantly, this chapter will brush upon the theoretical framework of this thesis and signify its theoretical contribution. Lastly, it will briefly discuss the timeframe included within this research, the financial crisis era.

Chapter 3 includes a detailed discussion of the study's theoretical framework. The chapter begins with summarising the research questions addressed in Study 1 and 2. Before discussing the theoretical underpinnings, the chapter will outline the theoretical conceptualisation of EO as well as the conceptualisation of the firm-level outcome, failure. Then, the chapter identifies the theoretical framework of this thesis, which was based on organisational learning theory and prospect theory. Finally, the chapter outlines the hypothesised effects from EO and each of its dimensions on firm performance (among surviving and failed firms) as well as the risk of failure.

Chapter 4 discusses the philosophical positioning underpinning (ontology and epistemology) of this thesis. Furthermore, the chapter includes a discussion of the research methodology and design as well as a reasoning for the chosen sample to test the EO-as-Experimentation perspective and test the research's hypotheses.

Chapter 5 outlines a discussion of the variables (independent variables, EO and its dimensions and controls, and dependent variables, firm performance measures) included in Study 1 along with their conceptual definitions and measurements. The chapter also outlines the regression models and describes the assumptions of the fixed effect regression used in the Study.

Chapter 6 outlines a discussion of the variables (regressors EO and its dimensions and the controls and the dependent variable, risk of firm failure). The chapter includes a conceptualisation of firm failure and its measurement. Lastly, it considers the assumptions of the survival analysis model used.

Before outlining chapter 7 and 8, the analysis chapters of Study 1, the thesis outlines a synopsis section on the comparison of the mean values of the EO construct and its main dimensions in the sample of surviving firms versus the failed firms.

Chapter 7 outlines the analysis results of Study 1 of the effects of EO and each of its dimensions on the firm performance measures (short-term proxied by return on assets and long-term performance proxied by Tobin's Q) in the sample of surviving firms. It starts with a descriptive analysis of the main constructs in the sample. It also presents the testing of the assumption of the fixed effect regression before outlining its results.

Chapter 8 presents the testing of the fixed effect regression in the sample of failed firms and outlines the descriptive statistics and the results of the effects of EO and its dimensions on the firm performance measures.

Chapter 9 outlines the analysis results of Study 2 of examining the effects of EO and its dimensions on the risk of firm failure. The chapter also considers the testing of the assumptions of the proportional hazard survival analysis model before outlining the results of the analysis. Furthermore, the chapter considers the effects of EO and its dimensions in each separate sample of failed firms.

Chapter 10 presents the discussion of the results of Study 1 and Study 2 and their implications for the theoretical development of the EO construct. Firstly, it briefly outlines the gaps and the ways in which the gaps were addressed. Then, it separately discusses the results of Study 1 and Study 2, followed by the theoretical contributions of this research.

Chapter 11 outlines the conclusions of this thesis and the limitations along with the possible future research avenues. It also briefly summarises the research findings and their theoretical and managerial implications.

Chapter 2

Literature Review

2.1 Introduction to the Chapter

In this chapter, the concept of entrepreneurial orientation (EO), its various connotations and conceptual definitions and dimensions are introduced. A review of the literature on entrepreneurial orientation is presented with attention given the three specific phases of research on EO.

The aim of the chapter is to develop and provide a clear illustration of the evolution of the EO literature, the current state-of-the-art of the body of knowledge on EO and deficits in current knowledge about the EO construct.

The chapter begins with outlining the various definitions and conceptions relevant to EO in the literature and the issue of its dimensionality. Later, problems with the definitional conceptualisation of EO are presented. The chapter then explains thoroughly the three distinct phases of EO. These include the conceptual development of EO, the examination of the EO-firm performance relationship, and the current stage of the EO-firm performance relationship. The chapter ends with a synopsis to the theoretical underpinnings of the thesis (i.e. organisational learning and prospect theory) and an outline of the studies that challenge the dominating EO-as-Advantage perspective in the literature.

The next section will consider the different definitions of the entrepreneurial orientation construct.

2.2 Definitions of EO

Entrepreneurial orientation or firm-level entrepreneurial behaviour has become a largely sought-after construct in the overall field of entrepreneurship (Covin & Lumpkin, 2011; Rauch et al., 2009; Wales et al., 2011). The concept of EO is the 'most established' and prominent theoretical and scientific robust construct with an extensive amount of empirical and theoretical considerations being directed towards it (Covin et al., 2006; Gupta et al., 2016; Wales, 2016).

EO has been explored in textbooks (Morris et al., 2010) and the business press as well (Certo et al., 2009). This is because researchers are intrigued to understand the role of EO in organisations due to its strategic relevance and its effect on firm performance as evidenced by the scholarly literature (Rauch et al., 2009).

There is an increasing interest in examining EO or firm-level entrepreneurship, considering the large number of studies from the 1970 to the 1990 era that focus on the impact of environmental, strategic, and organisational contingencies on EO (Zahra et al., 1999). A recent review has shown that the study of EO has significantly increased since 2000 (Martens, 2016). From 2000 until 2009, 115 articles were published on EO and from 2009 until 2016 as much as 281 articles were published in notable journals such as *Entrepreneurship: Theory and Practice* and *Journal of Business Venturing*. This reveals the significant exponential interest in the EO construct among the scholarly community. By the end of 2016, about 551 research studies on EO have been conducted (Wales, 2016).

EO has been conceptualised in several ways in the literature, in which researchers have used several labels such as entrepreneurial mode (Mintzberg, 1973), entrepreneurial intensity (Morris, 1998; Morris & Sexton, 1996), entrepreneurial posture (Covin & Slevin, 1991), entrepreneurial propensity (Brockhaus, 1980; Busenitz & Barney, 1997), entrepreneurial style (Chaston, 1997; Covin & Slevin, 1988; Khandwalla, 1976/77), entrepreneurial proclivity (Griffith et al., 2006; Matsuno et al., 2002; Stewart et al., 1999), entrepreneurship (Miller, 1983), intrapreneurship (Antoncic & Hisrich 2003; Kuratko, et al., 1990), strategic posture (Covin & Slevin, 1989, 1990; Covin et al., 1990) and corporate entrepreneurship (Morris & Paul, 1987; Wiklund & Shepherd 2003, 2005; Zahra & Covin, 1995; Zahra, 1996). Thus, researchers have not settled on a uniform definition of EO in the literature (Covin & Wales, 2012). Most importantly, all such past studies have employed some derivation of the same scale that was developed by Miller and Friesen (1982). Thus, essentially, they are measuring the same organisational construct, yet they have several labels attached to it (Zahra et al., 1999).

This lack of a uniform conceptualisation of EO, by attaching several labels to it, is problematic since it indicates that there is no consensus in the EO literature. Thus, advances in the EO literature would be deferred by conceptual disagreements and different definitions attached to the same construct. This lack of consistency risks stretching the EO concept and eventually leads to the devolvement of EO into a pseudo-science (George & Marino, 2011). The way that this thesis advances the EO literature is by refocusing and measuring EO at its essence, i.e. at the firm-level. The following paragraphs will outline the different definitions that researchers have provided to portray the EO concept and the key debate on whether EO is a dispositional attitudinal construct or a firm-level concept.

Most scholars (Basso et al., 2009; Gupta & Dutta, 2016) agree that the origin of EO is depicted in the works of Mintzberg (1973), Khandwalla (1976/77), and Miller (1983). Later, the concept of within-firm entrepreneurship was firmly demonstrated as a firm-level phenomenon in the form of EO by the works of Covin and Slevin (1989, 1991) and Lumpkin and Dess (1996, 2001). Entrepreneurial orientation involves a set of behaviours that characterise organisations' decision-making processes and practices towards competition, its markets, and its environment (Covin & Slevin, 1991; Lumpkin & Dess, 1996; Lyon et al., 2000; Miller, 1983). In this sense, EO involves a set of firm-level behaviours that drives decision-making towards creating new methods of production, new products, and entering new markets (Stevenson & Jarillo, 1990).

Initially, EO was conceived by Mintzberg (1973) as a managerial disposition and indicated that the degree to which entrepreneurial behaviour is manifested depends on the extent to which managers search for new opportunities under conditions of high uncertainty. Thus, Mintzberg (1973) emphasised the managerial characterisation of EO. Accordingly, Mintzberg (1973) considered that a firm's strategies or actions reflect the top managerial personalities or decisions. Khandwalla (1976/77) reinforced the concept that EO is a managerial disposition. He considered that EO is the propensity of top-level entrepreneurially oriented managers to take on risky and aggressive bold decisions in contrast to more conservative and cautiously-oriented decisions. Thus, Mintzberg (1973) and Khandwalla (1976/77) recognised EO as a managerial disposition to decision-making, and this was widely accepted by subsequent scholars (Covin & Slevin, 1988; Miller & Friesen, 1982).

Later, Miller and Friesen (1982), influenced by the managerial characterisation of EO (Khandwalla, 1976/77; Mintzberg, 1973) differentiated between conservative and entrepreneurially oriented firms based on the firms' managerial motives. Miller and Friesen (1982) found that the propensity of entrepreneurially oriented managers drives their firms to be more innovative and risk taking. Accordingly, firms are entrepreneurial in nature when their top managers innovate whilst engaging in risky behaviours or actions. Furthermore, Covin and Slevin (1988), in a similar manner to Khandwalla (1976/77) and Miller and Friesen (1982), considered entrepreneurial firms to reflect top managerial styles and philosophies. Thus, the authors considered conservative firms, in contrast to entrepreneurial firms, to reflect a top management style that is non-innovative, reactive, and risk-averse.

Building on the works of Mintzberg (1973), Khandwalla (1976/77), and Miller and Friesen (1982), and moving on from the managerial dispositional conceptualisation of EO, the EO construct was defined as a firm-level behaviour by Miller (1983). Miller (1983) did not frame it as EO, but rather as firm-level entrepreneurship. He defined it as the *joint* exhibition of innovativeness, proactiveness, and risk taking. Miller (1983) stated that the variables of innovativeness, proactiveness, and risk taking covaried significantly with EO. In doing so, Miller (1983, p. 770) indicated that an entrepreneurial firm is one that

> "engages in product market innovation, undertakes somewhat risky ventures, and is first to come up with proactive innovations, beating competitors to the punch".

In other words, Miller (1983) conceptualised EO as a composite construct composed of these three dimensions. Innovativeness is believed to be a central component of EO because of its emphasis on novelty, technological advancement, and exploring opportunities (Lumpkin & Dess, 1996). Innovativeness involves engaging in experimentation and creativity (Miller, 1983), and is central for high-technology oriented firms (Miller, 2011). Proactiveness, the opportunity-seeking component of EO, involves anticipating future demand rather than being reactive to environmental changes (Miller, 1983). Risk taking involves taking bold decisions and actions by venturing into new or emerging markets or by borrowing heavily and being willing to tolerate the uncertainty that comes with such entrepreneurial actions (Miller, 1983). An important aspect of risk taking is that it could itself result in an uncertain outcome that may carry a financial loss (Lumpkin & Dess, 1996). The behavioural perspective of the manifestation of EO within an organisation by Miller (1983) was the initial breakthrough of the managerial attitudinal perspective of EO first outlined by Mintzberg (1973). The behavioural perspective has enabled the objective measurement of EO at the firm-level in this thesis.

Consistent with Miller (1983), scholars have indicated that a firm is entrepreneurial when its decisions emphasise innovative, proactive, and risky strategies (Morris & Paul, 1987). This set a trend, in which the Miller (1983) definition of EO as the firm-level behaviours of innovativeness, proactiveness, and risk taking became the dominant characterisation and definition adopted in the literature. However, subsequent research studies also set in place a second feature of Miller's definition and characterisation that became dominant among studies of EO: the interdependency of its dimensions. This is captured in Zahra and Neubaum's (1998) definition of EO as *the sum or total* of a firm's behaviours, which encompass radical innovative, proactive, and risk taking strategic actions. Thus, investigators following Miller's conceptualisation of EO considered an entrepreneurially oriented firm to be one that exhibited innovativeness, proactiveness, and risk taking as a sum whereby the higher the exhibition of these three firm-level behaviours, the higher the EO of the firm.

To extend the characterisation of EO as a firm-level behaviour, Covin and Slevin (1991) indicated that it is the organisations' behaviours and actions that make it entrepreneurial, and that EO pervades consistently and is manifested recurrently throughout an organisation. Thus, in line with Miller (1983), Covin and Slevin (1991) considered that a firm is only entrepreneurial when it exhibits entrepreneurial behaviours consistently across time and throughout the organisation.

Subsequent authors have also considered EO as an organisational pervasive concept that pervades or manifests homogenously across hierarchical levels or departmental units in an organisation (Covin et al., 2006; Wiklund & Shepherd, 2003, 2005). That is, there is a subtle agreement that the level of EO and the relative composition of its dimensions is manifested in a similar degree in relation to its exhibition and impact across an organisation (Wales et al., 2011). However, Wales et al. (2011) indicated that EO is a much more complex 'multi-faceted phenomenon' that pervades heterogeneously across organisational hierarchical levels. Wales et al. (2011) extended Covin and Slevin's (1991) proposition and indicated that firm-level EO, as an organisational phenomenon, varies within a firm, and by extension may vary across levels of analysis within the firm. EO can then be demonstrated in different ways, varying spatially and temporally. This indicated that EO might be more complex than a homogenously recurring phenomenon. As such, firms may cycle from periods with high EO to periods with low EO (Wales et al., 2011) and sustaining entrepreneurial behaviours over time will likely increase the variation of outcomes (Wiklund & Shepherd, 2011). This is important since viewing EO as a homogenous pervasive phenomenon might have contributed to EO being continuously and consistently considered as an inherently positive and performance enhancing concept. This view is reductive to the complexity of the nature of EO. Instead, viewing EO as a multi-dimensional heterogenous concept can provide a more in-depth understanding of its outcomes (Gupta & Sebastian, 2014; Wales et al., 2011).

Subsequent to Miller (1983), Lumpkin and Dess (1996) differed from previous authors such as Miller (1983) and Zahra and Neubaum (1998) in two important ways. First, they added two dimensions to the conceptual definition of EO: 'competitive aggressiveness' and 'autonomy'. Competitive aggressiveness refers to an organisation's ability to stay ahead of its adversaries (Lumpkin & Dess, 1996). Autonomy refers to the degree to which an organisation encourages its employees to independently pursue entrepreneurial ideas (Lumpkin & Dess, 1996). Second, Lumpkin and Dess (1996) also explicitly emphasised that EO is not characterised by a joint or single exhibition of all its dimensions, but rather that a firm can be considered entrepreneurial if it exhibits one or more of the dimensions of EO. For instance, an organisation can be considered entrepreneurially oriented when it engages in new venture creation whilst avoiding risks. Thus, Lumpkin and Dess (1996, p.136-137) defined EO as:

> "processes, practices and decision-making activities that lead to new entry, entering new or established markets with new or existing goods or services as *characterized by one or more of* the following dimensions: a propensity to act autonomously, a willingness to innovate, take risks, a tendency to be aggressive toward competitors, and proactive relative to marketplace opportunities".

In contrast to Miller (1983) and studies in his tradition, Lumpkin and Dess (1996) conceptualised EO as a multi-dimensional construct wherein each of the dimensions of EO had varying effects that should be studied independently. To a much lesser extent, few authors have adopted the enlarged multi-five-dimensional version of EO put forward by Lumpkin and Dess (1996) in contrast to Miller's (1983) three-dimensional version. For instance, Hughes and Morgan (2007) offered one of the earliest studies into the independent effects of the five dimensions of EO on firm performance. Thus, there are contrasting views on the definitional conceptualisation of EO in the literature (three-dimensional versus five-dimensional). This thesis focuses on the three dimensions of EO (innovativeness, proactiveness, risk taking) as positioned by Miller (1983), but adopts the multi-dimensional conceptualisation of Lumpkin and Dess (1996). We adopt the three-dimensional conceptualisation of Miller (1983) since the three dimensions of EO are the core of what it truly signifies to be entrepreneurial (Covin & Lumpkin, 2011). We also adopt the multi-dimensional conceptualisation of EO by Lumpkin and Dess (1996) to enable us to examine the separate impact of the three EO dimensions.

Lumpkin and Dess (1996) also sought to clarify and extend the understanding of EO by indicating that there is a difference between the concept of EO and entrepreneurship. Accordingly, entrepreneurship represents new entry while EO represents the process that leads to new entry. Thus, EO is the process through which entrepreneurship within or by firms is achieved rather than the outcome of corporate entrepreneurship. Thus, EO can be considered as the driver of entrepreneurial endeavours of firms. The notion of (and emphasis placed on) new entry differentiates Lumpkin and Dess' (1996) definition of EO from its predecessors. Elements of 'new entry' might be attached to the innovativeness dimension raised in Miller's (1983) work and contained in the definition and operationalisation of EO put forward by Covin and Slevin (1991). In part, it characterises that an entrepreneurially oriented firm is more likely to embrace change in markets and at times lead that change through its actions. At the least, it admits that a firm exhibiting an EO will have a greater tendency to respond to external challenges in an entrepreneurial manner, while responding to the internal pressures, which generates in a manner that helps overcome the natural tendency towards inertia within organisations.

The above discussion gives a sense of the wide variation in the literature with regards to defining and conceptualising EO, a problem echoed by Covin and Wales (2012). Some scholars consider EO to reflect managerial attitudes whereas others consider it to be a firm-level behaviour. In that sense, scholars differ with regards to whether EO should be considered a behavioural construct or an attitudinal construct or both (Covin & Lumpkin, 2011; Miller, 2011). To confuse matters further, there are authors such as Covin et al. (2006) who conceptualised EO to include both behavioural and attitudinal components. Their definition of EO encompasses managerial beliefs and preferences as well as behaviours.

Anderson et al. (2015), on the other hand, indicated that there is a major challenge when mixing attitudinal and behavioural components within a single construct (EO). Thus, Anderson et al. (2015) reconceptualised EO as the managerial tendency to engage in risky endeavours as well as firm-level innovative and proactive behaviours. The authors indicated that most of the literature assumes that the different dimensions of EO share the same antecedents and most frequently researchers have used the Miller (1983)/Covin and Slevin (1989) summated EO scale. However, according to the authors, there should be a conceptual distinction and as such behavioural (innovativeness and proactiveness) and attitudinal components (risk taking) of EO should not be mixed. Accordingly, in the Anderson et al. (2015) paper, proactiveness and innovativeness were collapsed or confounded into a single dimension, which was the behavioural component of EO. On the other hand, risk taking was the attitudinal dimension of EO. This inconsistency in defining the EO dimensions makes a clear case for adopting a multi-dimensional approach.

As such, several researchers have conceptualised EO differently. There is no consensus in the EO research with regards to exploring the nature of the EO construct from the perspective of attitudes and behaviours. For the purposes of this research, however, under the dominant conceptualisation of EO in the literature, risk taking is considered as a behavioural component of EO. As Miller (1983) initially proposed, innovativeness, proactiveness, and risk taking are firm-level behaviours that constitute the EO construct. However, we adopt Lumpkin and Dess' (1996, 2001) proposition that the EO dimensions do not perfectly covary, thus having varied independent effects to enable us to examine the separate effects of the EO dimensions. Furthermore, research examining the separate EO dimensions has found that they have varying effects (Hughes & Morgan, 2007; Lomberg et al., 2016).

There has been quite a thorough exploration of the concept of EO with researchers providing multiple definitions. However, there is consensus in the literature that EO is a complex construct in which an entrepreneurially oriented firm is likely to be more inclined to exhibit more innovativeness, proactiveness, and risk taking. However, EO might result in uncertain outcomes because it involves risks. An issue that has received far less treatment is Lumpkin and Dess' (1996) belief that the dimensions that make up EO might vary independently such that their performance effects might not be uniform (Hughes & Morgan, 2007). Interestingly, at the time of their work, Lumpkin and Dess (1996) argued that there existed an untested biased assumption in the literature that higher EO leads to higher firm performance levels (Covin & Slevin, 1991). This sparked a wealth of research that sought to find empirical support for the relationship between EO and business performance, largely implicating a positive EO-performance relationship (Rauch et al., 2009).

The following section will be comprised of a discussion on the dimensions of EO and its gestalt composite conceptualisation versus its multi-dimensional view.

2.3 Dimensions of EO and the Gestalt Conceptualisation versus Multi-Dimensional View of EO

Originating from Miller's (1983) conceptualisation, the three-dimensional view of EO has been repeatedly acknowledged in the literature. This view considers EO to encompass: innovativeness, proactiveness, and risk taking. A significant research trend among past studies is to adopt the three-dimensional view of EO. Yet, Lumpkin and Dess (1996) added two dimensions to EO: competitive aggressiveness and autonomy. Thereby, there is a debate in the literature regarding the constituents of EO (three or five-dimensional view).

Furthermore, the dimensionality of EO (gestalt or multi-dimensional view) has been a subject of dispute. As a construct, EO has been treated by the majority of researchers as a composite construct, which considers that the different dimensions of EO relate in the same way to firm performance (Covin & Slevin, 1989; Miller, 1983). The gestalt conceptualisation of EO has been the dominant stance taken in the EO literature (Rauch et al., 2009). Miller (1983) introduced the three dimensions of EO (innovativeness, proactiveness, and risk taking) and indicated that a firm must be high in all three dimensions for it to be considered ‘entrepreneurial’. Thereby, a firm cannot be sufficiently or sustainably entrepreneurial if the dimensions of EO do not positively covary. Miller (1983) introduced the foundational conceptualisation of EO on which consequently many studies have adopted the composite three-dimensional conceptualisation of EO (Covin & Lumpkin, 2011; Lomberg et al., 2017).

However, a major limitation of the gestalt conceptualisation of EO is that it can obscure the independent effects of each of the dimensions of EO on firm-level outcomes. Thus, if the different EO dimensions are combined into a single construct and studied against performance, then this would conceal the independent effects of each of the EO dimensions (Hughes & Morgan, 2007). However, this is not to undermine the feasibility of the composite conceptualisation of EO, whereby the objectives of the research are simplistic in nature (Kreiser et al., 2002). This research does not aim to question the gestalt conceptualisation of EO. As Covin et al. (2006) noted, the question of the dimensionality of EO is not insightful for the research on EO.

More recently, the work of some scholars was shown not to align with the composite conceptualisation of EO (Hughes & Morgan, 2007; Kreiser et al., 2002; Karmann et al., 2016; Lumpkin & Dess, 1996; Zahra, 1993). Lumpkin and Dess (1996) conceptualised EO as a theoretical multi-dimensional concept with each of its five components (innovativeness, proactiveness, risk taking, competitive aggressiveness, and autonomy) representing independent aspects of entrepreneurial behaviour capable of varying independently. Thus, some researchers have shown that the risk taking dimension of EO has a curvilinear relationship with firm performance while innovativeness and proactiveness have direct positive relationships with performance (Tang et al., 2008). Similar studies have shown that risk taking dimension of EO has a negative effect on firm performance whereas innovativeness and proactiveness have a positive effect (Hughes & Morgan, 2007). Thus, studies have shown that the risk taking dimension has an opposing effect in comparison to innovativeness and proactiveness; thereby by combining the dimensions, it would result in the EO dimensions’ effects being masked out or cancelled (Dai et al., 2014; Karmann et al., 2016). However, against the popularity of the Miller (1983) gestalt conceptualisation of EO, Lumpkin and Dess’s (1996) conceptualisation of EO has been neglected. Most researchers have adopted Miller's (1983) three-dimensional composite conceptualisation of EO (Lomberg et al., 2017; Wiklund & Shepherd, 2003, 2005; Zahra & Garvis, 2000). Yet, few researchers have adopted the multi-dimensional conceptualisation of EO as proposed by Lumpkin and Dess (1996) (e.g. Hughes & Morgan, 2007). The multi-dimensional approach allows for finer detailed exploration of the varying effects of the different EO dimensions. However, no conceptualisation is regarded as universally appropriate or superior to the other, and it depends on the purpose of one's research (Covin & Lumpkin, 2011; Kreiser et al., 2002).

It is interesting that some researchers have altered the original dimensions of Miller (1983) and Lumpkin and Dess (1996) (Antonic & Hisrich, 2003; Jambulingam et al., 2005; Richard et al., 2004; Salavou & Lioukas, 2003; Tan, 2002; Voss et al., 2005). A meta-analysis of by Rauch et al. (2009) revealed that variations of the EO scale was done by about half of the studies without any theoretical justification. For instance, Antoncic and Hisrich (2003) indicated that EO, which they described as 'intrapreneurship' (which is sometimes itself used as an alternative term for 'corporate entrepreneurship') should include eight dimensions: product/service innovation, process innovation, proactiveness, risk taking, competitive aggressiveness, self-renewal, entering new businesses, and business venturing. Voss et al. (2005) replaced competitive aggressiveness with "competitive scanning". Tan (2002) and Jambulingam et al. (2005) added "long-term orientation" and "motivation" respectively to the original EO scale of Miller (1983). Some researchers have combined the dimensions of EO such as risk taking/proactiveness (Richard et al., 2004) and innovativeness/proactiveness (Salavou & Lioukas, 2003). Moreover, Covin and Miles (1999) confused matters further by using measures that were previously used to reflect proactiveness to instead capture competitive aggressiveness. They used organisational rejuvenation, strategic renewal, and domain redefinition to capture competitive aggressiveness. Other researchers have even limited EO to being innovative and proactive (Knight, 1997; Merz & Sauber, 1995). Thus, researchers have ambiguously altered the original dimensions proposed by Miller (1983) and Lumpkin and Dess (1996) respectively without providing clear justification and sufficient theoretical reasoning. George and Marino (2011) considered that it is important to build upon previous studies that have theorised the EO construct (Lumpkin & Dess, 1996; Miller, 1983) rather than build new dimensions or alter the already-existing and theoretically valid dimensions of EO. Thereby, there is a need to maintain consistency in the conceptualisations and definitions of EO. Such multi-dimensional ‘umbrella’ concepts such as EO are particularly subject to scholarly dispute and conceptual confusion and this warrants clearly defining such a concept prior to the research endeavour (Della Porta & Keating, 2008).

For such reasons, only the original dimensions of EO as initially proposed by Miller (1983) were investigated in this research thesis. George and Marino (2011) indicated that it is better for researchers to examine the original three dimensions of EO as proposed by Miller (1983), since the three-dimensional conceptualisation of EO lies at a higher level of abstraction and is more generalisable. The reason for excluding autonomy in this thesis is that it may be an individualistic characteristic, which is difficult to conceive at a firm-level. Some researchers have indicated that it may be an antecedent or a driver of EO rather than a dimension of EO (Edmond & Wiklund, 2010; Lumpkin et al., 2009). Moreover, other researchers have indicated that competitive aggressiveness might not be a separate dimension of EO and might be a part of the proactiveness dimension instead (Hough & Scheepers, 2008; cf. Lumpkin & Dess, 2001).

Each of the dimensions of EO, according to the multi-dimensional conceptualisation of Lumpkin and Dess (1996), establishes a unique relationship with a proposed dependent variable, signifying a firm-level outcome. Specifically, Lumpkin and Dess (1996) explained that the more a firm is entrepreneurially oriented, the more it will be displayed towards the entrepreneurial end of at least one of the five dimensions of EO. However, an entrepreneurially oriented firm does not have to be “high” in each dimension of EO. In other words, unlike the gestalt view of EO, the multi-dimensional view of EO posits that a firm can be entrepreneurial without having each of the dimensions of EO strongly and positively covarying. In addition, Lumpkin and Dess (1996) indicated that, although related, the dimensions of EO may vary independently. This implies that each dimension of EO may relate to firm-level outcomes in different ways (Covin et al., 2006; Hughes & Morgan, 2007). Lumpkin and Dess (1996) also predicted that some of its dimensions may have antagonistic effects on measures of firm performance. Hughes and Morgan (2007), found support for Lumpkin and Dess’s (1996) concerns, reporting a mixture of effects by the five dimensions of EO across a variety of firm performance measures.

For the purposes of this research, the multi-dimensional approach is adopted to allow the exploration of the various effects of each of the original three EO dimensions (as proposed by Miller (1983)) on firm-level outcomes. Furthermore, this research examined the overall effect of EO, even though the separate EO dimensions were considered to have independent effects. The reason that this research examined the overall effect of EO as well as its separate dimensions is that it provides the 'best of both worlds' analysis as Miller (2011) termed it. Moreover, it would reveal new insights into the theoretical construct 'EO'. Yet, this research did not consider that the EO dimensions form a 'collective catchall' (Miller, 2011) and sided with the multi-dimensional conceptualisation of EO, in which Miller (2011) noted that insights can be attained from examining the EO dimensions independently. EO was considered as an 'umbrella concept', which is multi-dimensional in nature and encompasses various dimensions. It would be reducible to consider such a complex construct as a uni-dimensional variable (Della Porta & Keating, 2008; Jackman, 1985).

With the issue of the dimensionality, arises the issue of measurement of EO. The measurement of EO must align with its theoretical conceptualisation (Covin & Wales, 2012). Most of the research on EO has adopted the original Miller (1983)/ Covin and Slevin (1989) summated EO scales in line with the gestalt conceptualisation of EO (Rauch et al., 2009). Researchers surprisingly, despite the findings that the EO dimensions have separate effects (Hughes & Morgan, 2007), have continued to combine the EO dimensions into a single EO index (e.g. Gupta et al., 2016). This approach masks the independent effects of each of the dimensions and creates a measurement conundrum for scholars with no clear answer (Covin & Wales, 2012). Thus, challenges have been raised by some researchers (Lyon et al., 2000), and the scales have been subject to criticism. Some items of the scales have shown evidence of low reliability (George & Marino, 2011; Kreiser et al., 2002). However, concerns about such measurements have been neglected by researchers likely because of the wide acceptability and well-recognised value of such scales and because of the desirability of the outcomes that are achieved (Covin & Wales, 2012), resulting in a risk of self-fulfilling fallacies. Yet, still the EO scales have been subject to testing and were shown to be valid and reliable measures of EO in different cultural contexts leading to the Miller (1983)/Covin and Slevin (1989) scales to become the dominant measures of EO (Knight, 1997; Kreiser et al. 2002). Thus, researchers have not been concerned with developing new alternative objective measures of EO (Covin & Wales, 2012). Theoretically speaking, adopting a gestalt approach to examining EO might reduce its firm value since it masks the independent effects of each of the EO dimensions. Thereby, EO might not be universally beneficial for firms to pursue and this cannot be captured sufficiently when adopting a gestalt approach (Hughes & Morgan, 2007). Thereby, this thesis has resorted to develop secondary objective measures to account for the independence of each of the EO dimensions in support of the multi-dimensional conceptualisation of EO (Lumpkin & Dess, 1996).

In conclusion, this thesis adopts the multi-dimensional conceptualisation of EO, which will enable the examination of the independent effects of each of the three dimensions of EO originally proposed by Miller (1983) (Hughes & Morgan, 2007; Lumpkin & Dess, 1996). If EO was instead taken as a composite construct, such a course of action would risk obstructing a clear comprehensibility of EO as a construct. Moreover, in terms of the thesis wider contributions and implications, it would be beneficial to identify the different unique effects of each of the dimensions of EO so that firms could seek the optimal combination to improve firm performance (Hughes et al., 2007; Kreiser et al., 2002). Thus, the objective of the following thesis is to explore the relationship between EO/separate EO dimensions and firm performance/risk of failure and as such reveal richer relationships.

The next section will consider the definitional problems of EO after outlining the different definitional and dimensional conceptualisations of the EO construct.

2.4 Problems with the Definitions and Dimensions of EO

There have been different perspectives in defining entrepreneurial orientation by researchers. Many researchers have questioned the nature of the EO construct (Covin & Lumpkin, 2011; Miller, 2011). The reason arguably behind the lack of an agreement to conceptualising EO could be due to different labels being attached to the construct, but fundamentally the various labels refer to the same construct.
The dimensionality issue of EO has also been a point of disagreement among

scholars. Some scholars consider EO to consist of innovativeness, proactiveness, and risk taking (Miller, 1983) whereas other researchers include two more dimensions competitive aggressiveness and autonomy onto the EO construct (Lumpkin & Dess, 1996). Furthermore, researchers tend to disagree on whether EO is an all-encompassing gestalt construct utilising a summated scale as initially positioned by Miller (1983) or as a multi-dimensional construct as alternatively positioned by Lumpkin and Dess (1996). Interestingly, most of the research on EO aligns with the composite conceptualisation of Miller (1983). Thereby, perhaps this might have mis-directed researchers from exploring the differential effects of the dimensions of EO on firm performance (e.g. Hughes & Morgan, 2007). Even though researchers acknowledge astonishingly that the EO and firm performance relationship might vary independently as Lumpkin and Dess (1996) argued, yet they tend to universally conceal the independent nature of the EO dimensions by combining them and summing them into an EO index (e.g. Stam & Elfring, 2008).

Building upon the previous critique of the EO literature, there has been a disagreement in the literature whether EO is a disposition/attitudinal construct or a behavioural construct (Anderson et al., 2015; Covin & Lumpkin, 2011). For instance, some scholars view the EO construct as a predisposition or an attitudinal construct, in which EO reflects top managerial beliefs and attitudes instead of firm behaviours (Khandwalla 1976/77; Miller & Friesen; 1982; Mintzberg, 1973). On the other hand, and similar to this thesis stance, most researchers view EO as a behavioural construct (e.g. Lumpkin & Dess, 1996; Miller, 1983). Lastly, there are researchers who have considered EO to include both firm-level behavioural outcomes as well as managerial attitudes and beliefs (e.g. Anderson et al., 2015; Covin et al., 2006).

The lack of an agreement with regards to whether EO is an attitudinal construct or a behavioural construct can be linked back to, as it has been noted by Miller (2011), the Miller (1983)/Covin and Slevin (1989) commonly used EO scale. This scale has some items that refer to firm behaviours whereas other items that are attitudinal in nature. Anderson et al. (2015) is one of the few studies that has re-conceptualised EO (Gupta, 2015). In line with Miller’s (2011) concern, the authors developed an alternative scale for EO and essentially considered EO as encompassing firm behaviours (innovativeness and proactiveness dimensions) and re-conceptualised the risk taking dimension of EO as a managerial attitude towards risk taking instead of being behavioural in nature (Anderson et al., 2015). Yet, this has only added more ambiguity to the EO construct. To avoid such ambiguity, the following thesis has resorted to using secondary objective measures for each of the EO dimensions that represent firm behaviours to reiterate the conceptualisation of EO at the firm-level (Miller, 2011; Miller & Le Breton-Miller, 2011).

Conceptualising EO as a disposition or as an attitudinal construct rather than a firm behaviour is problematic. Having a disposition or a tendency towards entrepreneurship does not ensure the presence of entrepreneurial behaviours. EO consists of sustained entrepreneurial behaviours. An occasional exhibition of entrepreneurial behaviours is not reflective of a firm exhibiting EO (Covin & Lumpkin, 2011). The point is that a firm's disposition to entrepreneurship can be associated with EO, but is not EO in itself. Thus, a managerial tendency towards an entrepreneurial posture or orientation may not enact into an entrepreneurial orientation at the firm level as there are certain constraints on the entrepreneurial proclivity of managers (i.e. in conditions of low managerial discretion or high board power) (Anderson & Covin, 2014; Gupta et al., 2016). Thus, EO has predominantly been conceptualised as a firm-level behaviour rather than as a managerial attitude or a disposition (Covin & Slevin, 1991; Lumpkin & Dess, 1996, 2001). As Covin and Slevin (1991, p. 8) indicated "behavior is the central and essential element in the entrepreneurial process". Thereby, this thesis considers EO to consist of firm-level behaviours.

The next section will begin with a review of the literature on EO highlighting the distinct three phases of EO: the conceptual development and the initial investigation of the EO-firm performance relationship, the further exploration of the EO-firm performance relationship, and finally the current state of the art of knowledge of the EO-firm performance relationship.

2.5 A Review of the Body of Knowledge on EO

Vij and Bedi's (2012) literature review on the EO construct divided the literature on EO into three models: (1) the EO construct model, in which EO is the dependent variable and researchers examine its antecedents (Miller & Toulouse, 1986;

Stevenson & Jarillo, 1990); (2) the EO strategy model, in which researchers focus on the alignment of EO with different strategies (Covin & Slevin, 1988; Dess et al., 1997; Khandwalla, 1976/77; Mintzberg, 1973); and (3) the EO-firm performance model, in which researchers focus on the EO-performance relationship and consider intervening variables (Covin & Slevin, 1989; Kreiser & Davis, 2010; Wiklund, 1999; Wiklund & Shepherd, 2005).

Past research on the EO phenomenon can be summarized into three types of thematic phases. The first phase of the literature on entrepreneurial orientation was characterised by a conceptual development of EO. The second phase of the literature on EO was characterised by an explicit focus on exploring the relationship between EO and firm performance to 'validate' EO as a meaningful subject for examination. Due to the large body of empirical evidence of the positive effects of EO on firm performance (Rauch et al., 2009), the research has acknowledged the precedence of EO for firms with few researchers challenging the EO-as-Advantage perspective as the third theme of the literature on EO (Gupta & Sebastian, 2014).

While much evidence exists on the EO-performance relationship, how and why its enhancing performance effects come about is not well understood. However, most of the research takes for granted a positive EO-firm performance relationship (Rauch et al., 2009; Rosenbusch et al., 2013). This is true regardless of the undercurrent studies that persist to reveal inconsistent results that seem to challenge the EO-as-Advantage perspective.

The phases signify the progression of EO in the literature with the dominant recognition of the concept of EO at the firm-level (Gupta & Sebastian, 2014; Martens et al., 2016). It is important to reiterate the origins of EO at the firm-level. Most of the studies take the stance that EO is advantageous to the firm. However, there are studies that reveal opposing effects of each of the EO dimensions. Thus, it is important to examine the effects of each of the EO dimensions on firm performance/risk of failure with the notion of EO at the firm-level. The following sections will focus on the development of EO in the literature from its initial conception until its maturation and prominence among entrepreneurship scholars. The three stages of EO can be considered as introduction, growth, and maturity similar to the product life-cycle of a firm (Gupta & Dutta, 2016). EO currently has reached a mature stage (Gupta & Dutta, 2016), yet recent studies still emphasise the positive impact of EO with clear knowledge voids on its implications (Wales, 2016; Wiklund & Shepherd, 2011).

2.5.1 Phases of EO Research Over Time

The following section considers the various phases of the EO literature. Several research articles were published recently that summarise the literature on EO and the gaps that are still present (Gupta & Dutta, 2016; Gupta & Wales, 2017; Wales, 2016). Most of the literature on EO considers EO to be beneficial for firms and coincides with the EO-as-Advantage perspective, which originates from the Resource-based view (RBV), a theory that considers EO to be a valuable resource for firms (Covin & Lumpkin, 2011; Covin & Miller, 2014; Gupta & Sebastian, 2014).

The importance of the dependent variable firm performance in EO research was first considered by Covin and Slevin (1991) (Covin & Lumpkin, 2011), and research to date still tests the value of EO on organisational performance (Martens et al., 2016). Yet, the focus has been on the effect of EO on short-term measures (such as profitability). This has caused the EO and firm performance research to be premature (Gupta & Wales, 2017). Wales (2016) noted that there is a need for more robust theorising in the EO literature and the emergence of new theoretical breakthroughs, which would revitalise the EO construct.

2.5.1.1 The First Phase of EO research

The beginning of the section considers the first phase on EO research, which is separated into the conceptual development of EO and its initial emergence as a theoretical construct in the literature and the initial investigation of the EO-firm performance relationship.

2.5.1.1.1 The First Phase of EO Research: The Conceptual Development of EO

Research on firm-level entrepreneurship can be traced back to the early works of Mintzberg (1973) and Khandwalla (1976/77) (Gupta & Dutta, 2016). Mintzberg (1973), recognised the strategic characterisation of an 'entrepreneurial strategy-making mode' based upon the extent to which firms were proactive and opportunity-seeking in conditions of high environmental uncertainty (Gupta & Dutta, 2016). Furthermore, Khandwalla (1976/77) was one of the early empirical works on EO who contributed to the measurement of the risk taking dimension of EO. This later influenced the development of the EO scale (Covin & Slevin, 1989). Consequently, Miller and Friesen (1982) developed a three-items measure of innovativeness and two-item measure of risk taking. Thus, such seminal works were a major influence in developing the EO scales by Miller (1983)/ Covin and Slevin (1989). Zahra et al. (1999) indicated that most studies have employed a derivative of the EO scale developed by Miller and Friesen (1982). Specifically, the Miller and Friesen (1982) paper influenced Miller (1983) by developing the measurement and defining one of the dimensions of the EO construct. Such authors showed that entrepreneurially oriented managers can sustain innovation and implement it more readily than their more conservative counterparts. The EO scale was further developed by Covin and Slevin (1989) by adding a three-item measurement of proactiveness and an item for the risk taking dimension, which yielded a three-item measurement for each dimension of EO. Most of the research on EO has adopted the Covin and Slevin (1989) scale, in which Knight (1997) revealed that the EO scale by Covin and Slevin (1989) was valid and reliable. Lumpkin and Dess (1996) considered that some items of the scale pertaining to proactiveness dimension captured the competitive aggressiveness dimension and as such considered two items as representing competitive aggressiveness instead.

The above measurements supplied the universal means to assess and measure the EO dimensions and have influenced the research community to utilise existing overly-used scales rather than develop new measures of EO. Perhaps by using alternative measures of EO, new revelations might arise to uncovering the nature of EO and the effects of each of its dimensions. Clearly, the scales might not be capturing the presence or absence of EO at the firm-level, but reflecting managerial perceptions of EO since they are administered to top managers. For instance, Covin and Slevin (1989) paper, which is acknowledged to be significant due to the development of the EO scale, has pushed scholars to presume that their developed scale measures EO at the firm-level when the EO scale is tailored to top managers and is reflective of managerial perceptions. Thus, there is a trend among the scholarly community to use such subjective scales that measure the entrepreneurial-strategy making mode of managers or the managerial styles of EO rather than measure EO at the firm-level. If one would be measuring EO and theoretically considering EO to be a managerial disposition, then such scales would suffice. To truly capture EO at the firm-level, objective measures must be developed instead.

The next section will examine the past research on the EO-firm performance relationship.

2.5.1.1.2 The First Phase of EO Research: The Initial Consideration of the EO-firm Performance Relationship

Early research has shown that the performance-enhancing effects of EO depend on certain conditions either external industrial or environmental factors (e.g. hostile versus benign environments) (Covin & Slevin, 1988, 1989, 1990; Khandwalla 1976/77; Lumpkin & Dess, 1996) as well as internal firm-specific factors (e.g. strategic mission) (Covin et al., 1994).

The initial investigation of the EO and firm performance relationship was dominated with a focus on external environmental intervening factors that could influence the effect of EO on firm performance. The effect of EO was shown to be positively related to performance only among firms in hostile environments; whereas firms in a benign environment benefited more from a conservative orientation (Covin & Slevin, 1989). Similarly, EO has been shown to be positively related to performance only among firms in emerging industries rather than mature industries (Covin & Slevin, 1990). Thereby, in certain environmental external conditions, it may not benefit firms to pursue EO. Even though the examination of external factors on the EO-firm performance relationship dominated the literature, some researchers have investigated the effect of firm-specific internal factors (e.g. strategic mission) on the entrepreneurial strategic posture and firm performance relationship (Covin et al., 1994). The positive effects of EO on firm performance were only observed among firms whose strategic mission is to increase their market share (Covin et al., 1994). Thus, such studies indicate that the positive outcomes of EO on firm performance depend on certain factors.

Some researchers have investigated the EO-firm performance relationship among different industries (high-technology versus low-technology industries) (Covin et al. 1990; Zahra & Neubaum, 1998). Specifically, Covin et al. (1990) found that firms operating in high-technology industries tend to use more entrepreneurially oriented strategies than their counterparts. However, EO was shown to have a positive relationship with performance in firms operating in low-technology industries. A possible explanation is that entrepreneurial orientation represents an aggressive and ambitious orientation, which is more prevalent among firms that operate in high technology industries. However, since such firms might be prevalently entrepreneurial in nature, it would not provide them with a greater advantage as it would for firms operating in low technology industries. Thus, firms that operate in low technology industries would benefit more from an entrepreneurial strategic posture (Covin et al., 1990). Yet, other studies have shown that firms operating in the high-technology context benefit more from adopting an entrepreneurial orientation (Zahra & Neubaum, 1998). This reverts to the point that not all companies might benefit from an entrepreneurial posture.

The context of the industry would be an important external factor to consider in testing the EO-as-Advantage perspective. Past research has often relied on heterogenous samples when examining the effects of EO (Wales, 2016). In this thesis, we focus on the high-technology industry, which is more relevant for the examination of EO and its firm-level outcomes. Studies examining heterogenous samples limit the potential of the research to be theoretically insightful and context-sensitive (Miller, 2011; Wales, 2016). By choosing a more homogenous sample of firms, then the EO-as-Experimentation perspective of the 'downside' of EO can be tested (Wiklund & Shepherd, 2011).

The research has tended to accept a priori that EO is advantageous for firms (Rauch et al., 2009). This is the case despite the initial proposition by Lumpkin and Dess (1996) and the above studies, which indicate that certain external and internal organisational factors affect the outcomes of EO. Furthermore, Lumpkin and Dess

(1996) posited that the EO dimensions themselves might exhibit un-uniform relationships with firm-level outcomes, either through direct or moderating effects (Lumpkin & Dess, 1996). As such, only few researchers have adopted the multi-dimensional conceptualisation of EO and aimed to examine the differing effects of each of the EO dimensions on firm performance. For instance, early researchers such as Venkatraman (1989) found that risk taking and competitive aggressiveness are negatively related to profitability of the firm, while proactiveness was found to be positively related to firm growth and profitability. This is very important to consider since we expect that the EO dimensions would impact firm performance differently. Yet, the multi-dimensional investigation of the effect of EO on firm-level outcomes has been largely overlooked in the past research even though the multi-dimensional conceptualisation would bring new insights.

The above discussion raises an important point that suggests EO is *not* intrinsically valuable to an organisation per se and is dependent upon organisational structures or competitive and environmental external factors. Thus, to assume that EO would lead to a positive performance outcome without considering the possible factors that affect the EO-firm performance relationship would be to mis-specify its applicability, value, and potential relevance. An important consideration when investigating the EO-firm performance relationship is not only internal or external organisational factors, but also the status of the firms (active or failed) in one's sample. Thus, by investigating the EO and the firm performance relationship among a sample of failed firms, which has not been regarded by researchers, would be insightful to the effects of EO when considering the premise that EO could be one of the potent factors affecting the viability of a firm (Wiklund & Shepherd, 2011). Thus, EO is as important as factors such as firm size and firm age, which have been investigated in the industrial economics literature and have been shown to affect the risk of firm failure (Josefy et al., 2017).

In summary, the initial studies above showed that EO's enhancing effects on firm performance depend on certain factors. The next section will consider the focus on the effect of EO on firm performance, yet largely implicating a positive EO-firm performance relationship, in which a large number of studies followed to emphasise that it is beneficial for firms to pursue a firm-level entrepreneurial orientation (Naman & Slevin, 1993; Zahra, 1991). This is despite the fact that early research revealed that the relationship of EO and a firm's performance is contingent on certain factors.

2.5.1.2 The Second Phase of EO research: The Relationship between EO and Firm Performance

The second phase of EO was characterised by an explicit focus on the relationship between EO and firm performance.

Most of the studies conducted during this second phase have argued that EO improves organisational performance (Kreiser & Davis, 2010; Wiklund, 1999; Wiklund & Shepherd, 2003; Zahra, 1996). Zahra et al. (1999) indicated that the breadth of research has emphasised the importance of EO in achieving higher performance levels.

This section outlines the different important studies that explore the EO-firm performance relationship by showing some inconsistencies, in which certain studies indicate a positive EO-firm performance relationship, while others show mixed or negative results. The beginning of the section explores the studies that emphasise the positive outcomes of EO.

2.5.1.2.1 Examples of Studies that Show Positive Returns from EO

Most of the studies during the second era of the research on the EO-firm performance relationship have largely emphasised the beneficial outcomes of EO, which have led researchers to conclude that EO, as a strategic orientation, provides firms with a greater competitive advantage (Rauch et al., 2009).

Most of the research on EO has been in the form of cross-sectional studies, yet there are few studies that have examined the effects of EO along a longitudinal timeframe (Wiklund, 1999; Zahra & Covin, 1995). As such, Zahra and Covin (1995) found that corporate-level entrepreneurship or EO is positively related to firm performance, which increases by time over a 7-year period, and that environmental hostility positively moderates this relationship. That is, the EO-firm performance relationship is more positive in firms that operate in hostile environments and this relationship strengthens over time. The findings of the aforementioned paper were in line with past scholars (e.g. Covin & Slevin, 1989; Zahra, 1993). Similarly, Wiklund (1999) has indicated that the strength of the positive EO-performance relationship grows over time. This indicates that the effects of EO extend on a long-term basis. This is an important revelation that EO's effects are long-term in nature, yet surprisingly even past studies that have examined the effects of EO on a long-term basis have only assessed the outcomes of EO on short-term measures of firm performance such as return on assets (ROA) and return on sales (ROS) (Zahra & Covin, 1995). Thus, there is limited attention to the consideration of the multi-dimensional nature of performance and the wide range of organisational performance metrics (Gupta & Wales, 2017). Furthermore, separating financial and market performance from firm survival might reveal that the effect of EO is not analogous across different metrics (Josefy et al., 2017). Yet, examining the effect of EO on firm-level outcomes is best adhered to by having 'the best of both worlds' approach (Miller, 2011). Thereby, this thesis examines the longitudinal effect of EO on short-term performance as well as long-term firm performance and firm survival, which are important to consider more so than short-term metrics.

Most importantly, the Zahra and Covin (1995) and Wiklund (1999) studies excluded from their samples firms that were dropped due to a merger or acquisition or bankruptcies and did not attempt to measure the EO levels of such companies or even to test the effects of EO levels on their performance and risk of firm failure. This is surprising as there exists a survivor bias even in the presence of longitudinal studies. For instance, in the Wiklund (1999) paper, the sample was dropped significantly from 808 to 132 cases. Had the researchers considered the possibility of EO being associated with firm failure, perhaps they would have shown important revelations of the effects of EO which would result in challenging the overarching EO-as-Advantage perspective.

The majority of researchers whom have argued for the superiority of an EO have utilised the Resource-based view (RBV) (e.g. Wiklund & Shepherd, 2003), the dominating theory of EO's competitive advantage. This has resulted in the prominence of the EO-as-Advantage perspective. Wiklund and Shepherd (2003) modelled EO as a moderator variable to examine the role of EO on the relationship of a firm's knowledge-based resources and firm performance. The researchers hypothesised, based upon the RBV, that EO is a valuable resource for the firm and is essential in achieving higher performance returns. Thus, it was revealed, as hypothesised, that EO positively moderates the relationship between a firm's ability to exploit its knowledge based resources and firm performance. Thereby, according to the authors, firms that exhibited EO performed better than others that did not. Similarly, Wiklund and Shepherd (2005) revealed that, as a main-effect, EO positively affected small business performance. Yet, utilising a configurational model, small firms that operated in unstable markets and had considerable access to capital benefited less from adopting EO. Thus, even with studies that revealed contingent factors that affected the EO and firm performance relationship, the researchers concluded that EO (as a direct effect on firm performance) was beneficial for firms (Wiklund & Shepherd, 2005). Thereby, the studies during this era reinforce the untested bias in the literature that EO enhances firm performance.

Surprisingly, similar to Zahra and Covin (1995) and Wiklund (1999), Wiklund and Shepherd (2003, 2005) studies, even though included a longitudinal timeframe, excluded businesses that failed. Thus, there is an under-representation of failed firms in previous studies. In that sense, in this thesis, in-depth understanding of the implications of EO on firm performance and the risk of firm failure relationship was achieved on a set of surviving and failed firms along a longitudinal timeframe, which included the financial crisis, a significant period that could be characterised as an unstable environment.

The importance of examining the EO and firm performance relationship is revealed through the meta-analysis by Rauch et al. (2009). Upon analysing 51 studies consisting of 1,259 companies, it was shown that there is a positive EO-firm performance relationship and a strong correlation existed between EO and firm performance (0.24). This explains the increasing interest of researchers in examining this relationship, in which such correlation between EO and firm performance is considered practically large in strategy research (Gupta et al., 2016).

Following the Rauch et al. (2009) meta-analysis, the EO-as-Advantage perspective became the dominant perspective (Martens et al., 2016). This is due to major limitations in the Rauch et al. (2009) meta-analysis, namely the dominance of the gestalt conceptualisation, cross-sectional bias, and survivor bias. This meta-analysis confirmed that most of the studies considered EO as a composite construct as initially proposed by Miller (1983) with only 13 studied out of the 51 considering the EO dimensions separately. Similarly, a more recent review by Wales et al. (2013a) noted that 123 of the 150 studies on EO, that were published from 1976 until 2010, adopted the composite construct of EO. Thus, the multi-dimensional construct proposition by Lumpkin and Dess (1996) has been neglected. It is worth mentioning that most of the studies in this meta-analysis were cross-sectional in nature, measuring EO at one point in time, with few exceptions (e.g. Wiklund, 1999; Zahra & Covin, 1995). Moreover, none of the studies examined the rational possibility that EO might be associated with firm failure or at least have negative consequences. Thus, there is a survivor bias. For example, by considering the risk taking component of EO, it is possible that EO might also lead to higher probabilities of failure if the firm extends its risk taking beyond a sustainable level. In other words, EO is associated with higher outcome variance, enhancing both rates of firm success and failure (Wiklund & Shepherd, 2011). Wiklund and Shepherd (2011) considered that EO might improve relative performance in surviving firms, but also would increase the possibility of firm failure. Yet, previous literature has been consistent in emphasising the important function of EO in attaining superior performance levels and gaining competitive advantage (Covin et al., 2006; Rauch et al. 2009; Wiklund & Shepherd, 2003, 2005; Zahra & Covin, 1995).

The examples of such studies outlined collectively led to an overriding normative position that the EO-firm performance relationship is positive with few challenges to this hegemony emerging. It seems that the studies have disregarded the nature of EO being a risky orientation and its possibility to exacerbate the decline of firms since the firm-level behaviours that are associated with EO are resource-intensive and each dimension of EO could result in significant costs for firms (Covin & Slevin, 1991; Rauch et al., 2009; Wales et al., 2013c). Thereby, this research reinforces the idea that EO is thought to be a double-edged sword with its power to enhance as well as increase the risk of firm failure. Thus, EO might not always translate into enhanced firm performance, in which there is a possibility of diminishing returns from EO (Kreiser et al., 2013; Wales et al., 2013c). The reason that such studies report only positive outcomes is that such studies are: mostly cross-sectional, measure EO as a managerial perception rather than at the firm-level, assess EO against short-term measures, and only consider firms that have survived when examining the EO and firm performance relationship. This is where this thesis is significant to the literature by addressing those gaps. This research can be considered as a response to the recent calls by Gupta and Wales (2017) and Wiklund and Shepherd (2011) to assess and align the measurement of EO by using secondary measures with long-term stock-market based measures of firm performance as well as firm failure along a longitudinal timeframe. The longitudinal aspect of this thesis can capture the causal effect of EO on firm-level outcomes. The use of secondary measures of EO and its outcomes (firm performance and failure) avoids common method variance or bias of survey-based studies, in which the instruments used are biased and would cause the variation in managerial responses (Short et al., 2010). This is due to the problem that several constructs are measured using multiple-item scales in surveys and spurious variations would arise due to the instruments used rather than to the actual constructs under examination.

There is a trend in the research to measure and capture EO using self-reported measures and run at the risk of common method variance (e.g. Covin et al., 2006; Short et al., 2010; Wiklund & Shepherd, 2003). This is a major limitation that could lead to not capturing the theoretical construct under examination. There is a question of construct validity and the need to have better assessments of EO that are long-term in nature (i.e. long-term firm performance or firm survival). Thereby, such studies have been tainted with a lack of capturing EO at the firm-level and testing the long-term effects of EO. Following the Rauch et al. (2009) meta-analysis, the research has taken for granted the positive outcomes of EO even though a persistent number of undercurrent studies of the EO-firm performance relationship revealed conflicting results (e.g. Hughes & Morgan, 2007).

The following section will outline the studies that have revealed conflicting results to the dominating EO-as-Advantage perspective, and which have shown inconsistencies regarding the EO-firm performance relationship.

2.5.1.2.2 Examples of Studies that Show Inconsistent Results on Performance by EO

The main contribution of studies in the past on EO have been on exploring various moderators or factors that affect the EO-firm performance relationship in different contexts (industries or firm sizes) (Gupta & Wales, 2017). Yet, such studies do not realise that there is a need to revitalise the measurement of EO and examine the effect of EO on failed firms. This is not to treat such studies as obsolete as they have offered a better understanding of the non-direct relationship of EO on firm-level outcomes and as such the contingent factors that come into play. Thus, such studies may reveal that in certain contexts the universal positive effects of EO do not hold. The following studies, similar to studies during the conceptual development era of EO, showed that the effects of EO might not be universally beneficial across alternative contexts.

It has been shown that the EO-firm performance relationship is not consistently positive, in which certain factors might cause diminishing returns from EO. The idea of the harmful effects of EO beyond a certain threshold were first noted by Miller and Friesen (1982) and Zahra (1993). Zahra and Garvis (2000) found that there are diminishing returns or “upper-limits” from pursuing an aggressive EO in hostile international markets. They revealed that the effect of EO on firm performance was an inverted U-shaped relationship in a hostile environment. Similarly, Bhuian et al. (2005) found that firm-level entrepreneurship had an inverted U-shaped effect on the relationship between market orientation and firm performance in the non-profit context. That is, market orientation had the highest positive effect on performance when EO was its moderate levels. Thus, it may not benefit to excessively pursue EO and the positive effects of EO might not be consistently present when EO is at a high-level.

Most studies have been conducted in the US context whereby EO was shown to mostly have a linear positive relationship with performance. However, Tang et al. (2008) studied the EO-performance relationship in an emerging economy, the Chinese national context. In this context, the relationship was indicated to be curvilinear, such that high investment in EO led to diminishing positive returns on firm performance (inverted U-shaped relationship). Similarly, Kemelgor (2002) showed that the EO-performance relationship was stronger and more significant in the case of US firms rather than firms in the Netherlands, and that firms in the US displayed higher EO levels. It is of relevance to better account for context when studying the EO-performance relationship. Thereby, the focus of this thesis is on examining the effect of EO on firm-level outcomes among US firms only.

In line with the multi-dimensional conceptualisation of EO by Lumpkin and Dess (1996), Hughes and Morgan (2007) set out to examine the independent impact of each of the EO dimensions (innovativeness, proactiveness, risk taking, autonomy, and competitive aggressiveness) on firm performance. Their results indicated that innovativeness had a positive effect on product performance, proactiveness had a positive effect on product and customer performance, whereas risk taking had a negative effect on product performance. Competitive aggressiveness and autonomy showed no effect on firm performance. Similarly, other researchers have shown that the EO dimensions should be modelled independently (Kreiser et al., 2002; Runyan et al., 2012) and that each of the EO dimensions had separate effects (Kreiser et al., 2013; Short et al, 2010). For instance, Short et al. (2010) revealed that innovativeness and proactiveness had positive effects on firm market value, whereas risk taking was shown to have a negative effect on performance. Thus, by deconstructing the various components of EO, each component had a different effect on firm performance. By approaching EO in a gestalt form, it would mask the independent effects of each of the different EO dimensions.

It is apparent that the majority of previous research assumes that EO is advantageous to firms that practice it. However, the theoretical basis of the EO-performance relationship has seldom been illuminated (Wiklund & Shepherd, 2011). The possible outcomes of EO on firm failure have not been considered. As the literature indicates, the relationship of EO and firm performance might not be always positive in certain contexts, such as in small firms (Wales et al., 2013c). This inconsistency in performance outcomes from EO is due to the possibility that EO is correlated with a higher performance variance (Wales et al., 2013b; Wiklund & Shepherd, 2011). Thereby, EO has the potential to lead to ‘below zero returns’ among resource-constrained small firms (Wales, et al., 2013c). This era has been dominated with the positive stance of the effects of EO despite such studies that indicate that EO might not be universally beneficial. The persistent concern over negative effects of EO on firm performance has been rather swept aside. We posit that the performance variance producing nature of EO has not been evident in the literature due to a survivor bias.

The next section will focus on the third phase of the EO-firm performance relationship, which outlines the current understanding of EO.

2.5.1.3 The Third Phase of EO Research: The Maturation Stage of the EO-Firm Performance Relationship

The third phase of EO has reached a maturation stage since the positive EO-firm performance relationship has been reiterated among scholars. However, this is at odds with studies reporting low correlations between some of the EO dimensions and firm performance (Lumpkin & Dess, 2001) and with other studies that failed to show a significant relationship between EO and firm performance (Covin et al., 1994) or among some of its specific dimensions and organisational performance (Hughes & Morgan, 2007). Interestingly, there are also some studies that have indicated that the relationship between EO and firm performance is not as straightforward as it may seem, such that the EO-firm performance relationship may reflect an inverted U-shaped effect (Bhuian et al., 2005; Tang et al., 2008). This indicates that there are contingent factors that impact the outcomes of EO. Thus, it is important to consider such contingencies. This thesis distinguishes itself by considering the possible effect of EO on firm failure and examining the effect of EO and its dimensions on firm performance among failed firms.

The beginning of this section will consider the studies that have corroborated the beneficial outcomes of EO.

2.5.1.3.1 The Dominance of the Positive EO-Firm Performance Relationship

EO has been considered as a mature and prominent construct within entrepreneurship and strategy research, which has reached an adolescence stage (Gupta & Dutta, 2016; Slevin & Terjesen, 2011). The predominant positive EO-performance relationship still exists, and this attests to the maturation of the EO construct, with the same logic being reiterated and the same measures being used by EO researchers (Andersén, 2010; Gupta & Dutta, 2016). The maturation of the EO construct came into effect after acknowledging EO as a firm-level construct which enhances firm performance (Gupta & Dutta, 2016).

A recent meta-analysis, by Gupta and Wales (2017) of 119 research articles from 1986 to 2011, examined the EO-firm performance relationship and found that most of the studies (90%) assessed EO against perceptual indicators of firm performance, in the form of performance relative to competitors, rather than objective archival measures. Most importantly, researchers have largely relied on self-developed performance measures rather than on established measures. Furthermore, most studies relied on accounting and growth-based measures of firm performance rather than on stock-based measures (Short et al., 2010) or survival (Walter et al., 2006; Wiklund & Shepherd, 2011). Even alarmingly, more than half of the studies employed a performance index that combined several performance indicators, in which the use of a hybrid performance measure has been growing over time. Thereby, the multi-dimensional conceptualisation of firm performance has been largely ignored. The effects of EO thereby must be examined against alternative measures of firm performance rather than being combined and aggregated into a performance index (Gupta & Wales, 2017).

As such, previous meta-analysis by Rauch et al. (2009) was more concerned with the performance effects of EO rather than testing the construct validity of the used performance measures. This thesis examined the specific performance targets (ROA and stock-based measures) of each of the EO dimensions (within the context of large high-technology US firms). Stock-based measures are important to consider since the effect of EO within capital markets and its usefulness for shareholders would facilitate the advancement of the understanding of the long-term outcomes of EO (Gupta & Wales, 2017). Furthermore, risk of firm failure is important to consider as the examination of EO against firm survival has been absent from the literature despite calls by Wiklund and Shepherd (2011) (Gupta & Wales, 2017).

Few studies have presented new perspectives on EO (Wiklund & Shepherd, 2011) and have employed alternative measures of EO and firm performance (Miller & Le Breton-Miller, 2011; Short et al., 2010). Thus, measuring the effect of EO on firm value, by using an objective assessment of EO, has been overlooked (Gupta et al., 2016; Miller & Le Breton-Miller, 2011). The assessment of EO against Tobin's Q, a forward-looking firm valuation market-to-book ratio, which represents the stock market value of a firm relative to its replacement cost, would reveal the risks or hazard associated with EO (Gupta et al., 2016). Firm valuation measures supersede accounting measures in examining and assessing the long-term impact of EO. Thereby, this thesis used Tobin's Q as the objective assessment of EO's long-term effects.

Even though the use of secondary proxies to measure each of the EO dimensions would allow one to measure EO at more than one-point in time and assess its longitudinal effect against objective long-term firm performance measures, there is a concern of construct validity when using archival proxies (Ketchen et al., 2013). Construct validity is concerned with the extent to which the objective proxy is measuring and capturing the construct in question. To address this issue, the proxies that were used to measure the constructs were ensured to be consistent with the definitions of the constructs. This guarantees that there is a strong conceptual overlap between the theoretical construct and the archival proxy used to measure it (Ketchen et al, 2013). Secondary data supersedes survey-based measurement since it has high ‘face validity’, is ‘non-reactive’, and enables measuring or quantifying relationships over time (Mthanti & Ojah, 2017).

The Miller and Le Breton-Miller (2011) paper was the first to measure EO utilising objective measures. A sample of fortune 1000 firms was used to test the effect of EO on long-term firm performance measures (Tobin’s Q and Total Shareholder Return), along a longitudinal timeframe from 1996 until 2000. Yet, the authors bundled the various dimensions of EO into a summated index and showed that EO had a direct positive effect on firm performance and prematurely considered that EO was beneficial for large firms. Furthermore, Short et al. (2010) was the first to measure EO using computer-aided text analysis of shareholder letters and examined the effect of EO against Tobin’s Q, using a sample of S&P 500 and Russell 2000 small firms. They revealed a positive effect of EO on firm performance. Even though the Short et al. (2010) and the Miller and Le Breton-Miller (2011) studies examined the firm valuation of EO, these studies did not account for the possibility of failure from EO (Wiklund & Shepherd, 2011). Thus, this thesis re-examined the long-term value of an EO utilising a sample of surviving and failed firms.

The dominating gestalt view of EO still plagues research (e.g. Rosenbusch et al., 2013). Recent researchers have examined the shared bilateral effects among the EO dimensions (Lomberg et al., 2017). The perspective of the shared effects is concerned with the covariance among the EO dimensions (i.e. that the effect of one of the EO dimensions on a firm’s performance is dependent upon other dimensions) and is in line with Miller’s (1983) proposition of the composite nature of EO. As such, Lomberg et al. (2017) revealed that only proactiveness, from the EO dimensions, had a unique effect on firm performance, whereas innovativeness and risk taking did not have a significant independent effect. The researchers also found a strong bilateral shared effect between innovativeness and proactiveness. The results of the paper corroborate a stream of previous research in over-emphasising the perspective of the shared effects between the EO dimensions. The paper is limited by examining such effects across a cross-section rather than longitudinally. If the researchers examined such effects longitudinally, different results might arise and the shared effects among the EO dimensions might not be as strong over time. Interestingly though, the researchers did find a marginal significant unique effect of two EO dimensions (innovativeness and proactiveness) in the high-technology industry. However, the researchers concluded that the shared effects among those two dimensions superseded in explaining the variation in firm performance. Most importantly, the paper revealed that the EO dimensions may be more important in different contexts (e.g. low-tech, high-technology, multi-sector). Thereby, this thesis focused on examining the effects of the separate EO dimensions only in the high-technology sector, which is more prominent than other sectors in utlising EO (Short et al., 2010).

The next section will consider the studies that represent challenges to the dominating EO-as-Advantage perspective.

2.5.1.3.2 Studies Highlighting the Risks of EO

A recent publication by Gupta and Gupta (2015) examined the effects of EO on a long-term basis over a 10-year span, and their findings indicated that the positive effect of EO became less significant over time and that external environmental factors impacted the superior effect of EO on a firm's performance. Furthermore, Gupta et al. (2016) examined the longitudinal effects of EO on firm value (Tobin's Q), using a four-year panel dataset, and showed that the positive impact of EO on the stock-market value of firms is contingent on the organisational and industrial discretion. This shows that the strength of the positive EO-firm performance relationship has been over-estimated among researchers, who have mostly relied upon cross-sectional studies to concur that EO is beneficial for firms. Even with longitudinal studies the effects of EO were only confined to surviving firms (e.g. Wiklund, 1999).

Similar to some studies during the second phase, in this era, it was shown that in certain contexts EO is harmful on a firm's performance (Revilla et al., 2016; Wales et al., 2013c). Wales et al. (2013c) examined the EO-firm performance relationship in the context of small firms. These researchers indicated that small firms might lack the firm-level capabilities to benefit from an EO. As hypothesised, the researchers found an inverted U-shaped relationship between EO and firm performance. In other words, high levels of EO were advantageous until a certain point where positive returns diminished, and performance dropped. The reason for such a phenomenon is that in the absence of certain capabilities for small firms, high levels of EO were shown to be harmful to firm performance. Similarly, EO has been shown to have non-uniform or negative outcomes among family firms (Lumpkin et al., 2010; Naldi et al., 2007; Revilla et al., 2016).

Other contexts have been also investigated by scholars. For example, Kraus et al. (2012) examined the EO dimensions-performance relationship in an economic crisis context during the 2009 period, which is characterised by uncertainty and instability. The results of the paper indicated that proactiveness directly had a positive effect on firm performance. The interaction of innovativeness with market turbulence had a positive effect on performance. However, the interaction term of risk taking with market turbulence was found to be negatively and significantly related to firm performance. Similarly, Soininen et al. (2012) have shown that the more innovative and proactive a firm is, the less it would be affected by an economic crisis. However, the more risk taking behaviour it exhibited, the more likely that its profitability would be affected. This reinforces the point that the EO dimensions have various effects on the EO-performance relationship.

EO has been surprisingly linked to CEO overconfidence (Engelen et al., 2015), CEO narcissism (Wales et al., 2013b) as well as corruption (Karmann et al., 2016). Specifically, Karmann et al. (2016) stated that even though the literature on EO unquestionably accepts its positive effects, previous researchers have shown that EO might predispose managers with strong entrepreneurial disposition to engage in corruption and to exploit bribery opportunities (Karmann et al., 2016). The researchers investigated the acts of corruption from the top-level management team over the span of 3 years and measured the level of EO within the sample of firms. The results of the paper showed opposing effects of the different dimensions of EO.

The reason for this divergence is that, as the researchers hypothesised, the risk taking component of EO put forward a “dark side of EO”. This significantly increased the possibility of the emergence of corrupt behaviours. Yet, innovativeness offset that effect by decreasing the possibility of corrupt behaviours. The researchers also studied EO as a composite construct against organisational corruption and found no significant effect on corruption. This is due to the opposing effects of each of the dimensions innovativeness and risk taking, and serves to validate the point that the EO dimensions are better studied in a multi-dimensional model of EO. Furthermore, these findings raise theoretical and empirical concerns that EO is a double-edged sword capable of causing problems for organisations. Thus, EO should not be considered as a universally positive phenomenon that results in solely positive organisational outcomes.

The next section will consider the few studies that have examined the effect of EO on firm survival/failure. The significance of the next section is in specifying the overwhelming amount of survivor bias in EO research, which is remaining and even continuing to grow (e.g. Eshima & Anderson, 2017; Lomberg et al., 2017). The contribution of this thesis is in resolving this survivor bias.

2.5.1.3.3 Studies Examining EO and Firm Survival/Failure

A recent review of management research on survival revealed that there is an increasing interest in examining firm survival in entrepreneurship and strategy research (Josefy et al., 2017). Few studies have examined the effect of EO on firm survival/failure.

Most of the research has not been consistent in its definition of failure. Researchers have not specified the criteria of classifying failed firms, as some researchers placed firms that had undergone an acquisition as having failed without explicitly stating it. In this thesis, we considered firm failure to include bankruptcy or liquidity, privatisation, and discontinuity of ownership. Yet, distinguishably from previous researchers, we did not treat all such outcomes collectively as being the same (Josefy et al., 2017). Instead, we separately examined the effect of EO across different types of failure. Previous researchers have disagreed on whether discontinuity of ownership is considered as a type of firm failure. Some researchers have excluded acquisitions from their sample (e.g. Revilla et al., 2016), whereas others have separated acquisitions from success and failure (e.g. Wiklund & Shepherd, 2011). According to this thesis, even though discontinuity of ownership may not be as a clear indicator of failure as bankruptcy or liquidity, it was still considered as a type of firm failure. To ensure the robustness of considering acquisitions and privatisations as failures, this thesis resorted to using Altman's Z-score, which was used to resemble the risk of exit of firms, that failed due to an acquisition/privatisation, from a potential bankruptcy had it not been for the acquisition (Josefy et al., 2017; Wiklund & Shepherd, 2011). The definition of firm failure will be expanded in the theoretical chapter 3 and its operationalisation in the methodological chapter 6.

Mousa and Wales (2012) examined the effect of EO on the long-term survival rate in the context of IPO US firms during the periods 2001 until 2005. The researchers found that EO improved long-term survival of IPO firms. Specifically, they showed that the probability of IPO survival increased by 1.9 percent with every unit increase in EO. Their findings indicated that EO enhanced IPO firm survival, and this is in line with the predominant view that EO is beneficial for firms. Yet, other researchers have shown that EO may enhance the failure rate of firms. Revilla et al. (2016) investigated the moderating effect of EO on the family involvement-survival rate of 396 manufacturing firms in Spain. This longitudinal study was undertaken across periods spanning the pre-crisis to post-crisis (2007-2013). The results indicated that EO reduced the survival advantage of family firms. That is, EO negatively moderated the relationship between family ownership and survival rate. As the level of EO increased, the survival gap between family and non-family businesses became tighter. This shows that EO is not beneficial to pursue for all firms such as family owned firms. The Revilla et al. (2016) paper reaffirmed the view that the relationship between EO and performance is not as simple, positive and direct as previous research indicated, and offered context as one basis to postulate why this might be the case.

Josefy et al. (2017) noted that firm failure is caused by different factors across firms of various developmental stages. The EO dimensions have been shown to have varying effects across larger versus smaller firms (Josefy et al., 2017). In this thesis, we focused on large firms rather than less developed smaller firms when examining the outcomes of the EO dimensions, since large firms are more likely to adopt an entrepreneurial orientation within competitive markets (Zahra, 1991). Yet, the choice of large publicly traded firms has been rarely considered in EO research (Miller & Le Breton-Miller, 2011; Rauch et al., 2009). Furthermore, studies have disregarded the effect of EO, a potent firm-level behaviour, on the probability of firm failure. Thereby, it is vital for this thesis to move forward the understanding of the double-edged nature of EO by examining its effect on firm failure.

The next section will focus on the studies that have revealed that EO may entail risks, and outline the theoretical perspective of this thesis.

2.5.2 Challenges to the Hegemony of the 'EO-as-Advantage' Perspective

There is lack of incorporation of theory in EO research. Wales (2016) searched the combination of 'theor' and 'EO' and found it to be in 365 of 551 research papers on EO. This indicates that there is a lack of theoretical grounding in some of the research on EO. Thus, this thesis aimed to advance the understanding of the EO-firm-level outcomes relationship by utilising organisational learning theory and prospect theory.

Despite evidence of mixed results, the literature is mostly consistent in adopting the 'EO-as-Advantage' perspective, or in other words 'EO as a performance-enhancing strategy' (Wiklund & Shepherd 2011). Yet, research has indicated that the effect of EO on performance is moderated by several contingencies, both external and internal to the firm (Covin et al., 2006; Covin & Slevin, 1988, 1989; Kraus et al., 2012; Lumpkin & Dess, 1996, 2001; Wiklund & Shepherd, 2003, 2005; Zahra & Covin, 1995; Zahra & Garvis, 2000).

The positive effect of EO are dependent on certain contextual factors based upon *March's theory of organisational learning* (March, 1991) (Hughes et al., 2007). According to the theory of organisational learning, learning can be either considered as explorative or exploitative. Explorative and exploitative learning reflect different modes of knowledge generation, which result in the manifestation of different firm-level behaviours. Explorative learning generates new knowledge with the high probability of resulting in uncertain outcomes since it involves venturing into activities that are opportunity-seeking and risky and far from the firm's competencies. On the other hand, exploitative learning refines existing knowledge to generate incremental knowledge resulting in certain and immediate returns.

Firms must alternate between explorative and exploitative learning to achieve optimal performance and maintain their viability (Uotila et al., 2009). Thereby, focusing solely on explorative activities can be detrimental for a firm. The higher the relative explorative orientation, the more detrimental it is on a firm's long-term performance. Such effects are mostly evident among R&D (Research and Development) intensive industries (Uotila et al., 2009).

The EO-as-Experimentation perspective was introduced by Wiklund and Shepherd (2011), who considered an alternate understanding of the EO-performance relationship. The EO-as-Experimentation perspective draws from organisational learning theory and theorises that a higher level of EO would likely result in a wide range of outcomes, with some firms benefiting from EO whereas other firms possibly failing from unsuccessful entrepreneurial activities.

According to the EO-as-Experimentation perspective, a high level of EO exhibited among firms might either result in 'home-runs' or losses. Thus, there is a cost-benefit trade-off to EO (Dai et al., 2014; Wales et al., 2013c). Since EO encompasses innovativeness and proactiveness components as well as a risk taking component, it results in variance in firm performance. The dimensions of EO are more aligned with the domain of trial-and-error and experimentation, and proactive discovery, and have more tolerance for uncertainty; thereby EO seems to involve explorative learning rather than exploitative learning (Wiklund & Shepherd, 2011).

Explorative activities can either result in successful or ambiguous outcomes, which generate performance-variance with some firms benefiting from EO, whereas others failing as a result of adopting EO. This variability of outcomes resulting from EO, a variance-seeking explorative firm-level behaviour, characterises the double-edged nature of EO. This means that not every firm is able to leverage EO into producing positive outcomes. A recent publication by Patel et al. (2015) revealed that EO aligned with the EO-as-Experimentation perspective and that a high EO led to a variance in the innovation outcomes, resulting in either successes or failures.

The EO-as-Experimentation perspective also draws insights from *prospect theory*, in which according to myopic risk aversion, firms are less risk averse to decisions that are long-term in nature and that are less frequently evaluated. Whereas firms are more risk averse to decisions that are short-term in nature and that are evaluated on a frequent basis (Benartzi & Thaler, 1995; Slevin & Trejesen, 2011; Swift, 2016). This indicates that EO, which is an explorative and risky endeavour in nature, results in firm-level outcomes that must be assessed on the long-run.

The nature of innovativeness, proactiveness, and risk taking could possibly materialise in performance extremes, characterised by high performance returns in surviving firms, yet also to higher rates of business failures among other firms. Innovativeness represents the development of new products and/or processes that deviate from the firms' competencies and may result in a positive outcome or a loss. Proactiveness represents 'long-term gambles' on futuristic market needs, which may result in successful or unsuccessful outcomes (Patel et al., 2015). Lastly, risk taking involves engaging in activities that are of an experimentation nature and whose outcomes are uncertain (Patel et al., 2015; Wiklund & Shepherd, 2011).

This emphasises the fact that prior research has been affected by a selection bias (surviving firms). This means that EO might have shown to have positive performance effects due to a selection sample bias of surviving firms only. Few research studies have assessed the EO-as-Experimentation perspective to explain why some entrepreneurially oriented organisations perform better than others, whereas others that might even possibly collapse (Patel et al., 2015). Wiklund and Shepherd (2011) were the first to reveal that, even among firms that failed, levels of EO were high. This thesis tested the EO-as-Experimentation perspective by examining the effect of EO on long-term firm performance as well as on risk of firm failure. An exhibition of high levels of EO among failed firms could indicate that either a high EO might have contributed to their failure or that such failed firms increased their level of EO in response to being in distress (Slevin & Terjesen, 2011; Wiklund & Shepherd, 2011). Thereby, this thesis was able to test the cause-effect relationship between EO and firm performance/failure by utilising a longitudinal dataset.

The positive EO-firm performance relationship has been critiqued in the literature by few researchers (Andersén, 2010). Similar to Gupta and Wales (2017), Andersén (2010) reviewed recent articles on EO and considered limitations of the most prominent publications on EO (Wiklund, 1999; Wiklund & Shepherd, 2003, 2005; Zahra & Covin, 1995). To summarise, the author considered that the limitations involved: the use of the subjective EO scales of Miller (1983)/Covin and Slevin (1989) or a derivation of it, the overuse of subjective profitability and growth performance indicators that are sometimes combined into a performance aggregated index, the generalisability of the positive effect of EO onto firms that are of different sizes, and the survivor bias of the EO-firm performance studies. These limitations are significant to consider and address. Thus, this thesis addressed these limitations by using objective measures of EO and its dimensions, including several objective performance indicators separately, focusing on the implications of EO onto large US firms belonging to the high-technology industry, and lastly including a set of surviving and failed firms throughout a longitudinal timeframe from the pre-crisis (fiscal year 2000) to the post-crisis period (fiscal year 2014).

The next section will introduce the context of the thesis, the financial crisis.

2.5.3 Importance of Examining Pre- to Post-Crisis Period in EO Research

The global financial crisis, a wide historical event, provides an interesting context to examine the EO-firm performance/failure relationship. The 2008 financial crisis occurred on a global scale-turbulence in one country and was highly contagious, leading to instability in other countries. A financial crisis can be defined as “a wider range of disturbances, such as sharp declines in asset prices, failures of large financial intermediaries, or disruption in foreign exchange markets” (De Bonis et al., 1999, p. 60). The global financial crisis of 2008 had detrimental effects on the economy, effects which have not been witnessed since the Great Depression of the 1930s (Vašková & Vašková, 2010). Between 1978 and 2007, debt held by financial companies grew from $3 trillion to $36 trillion (United States Financial Crisis Report, 2011). The entrepreneurial drive of firms during the financial crisis reveals that there are dark sides to taking greater risks. The increased risks were encouraged by the increased profit volatility. The eve of the financial crisis was dominated with the use of innovative novel techniques to spread the risks. However, such a process in a deregulated market increased the risks (Knights & McCabe, 2015). Specifically, Loviscek and Riley (2013) has shown that the market risks were increasing during the period of 2004-2008.

A study on the effect of the EO dimensions on the firms' impact from the recession showed that firms that are more risk taking are more negatively affected from the recession (Soininen et al., 2012). It has been also shown that the risk taking dimension of EO negatively impacted firm performance during the financial crisis (Kraus et al., 2012). That is, risk taking during turbulent markets, such as the financial crisis, led to a possibility of more differentiated returns, even though actors assumed that such are calculated risks (Kraus et al., 2012).

The conception among institutions was that the 'financial innovation' was distributing the risks, but it was concentrating the risks to a smaller number of organisations (Engelen et al., 2011). Thereby, the increased profit volatility was also accompanied with greater losses during the financial crisis (Beck et al., 2016), in which there was a failure to assess the risks (Knights & McCabe, 2015). There is a bright and dark side to financial innovation, i.e. financial innovation is positively related to economic growth, but it also promotes more risk taking among financial institutions (Beck et al., 2016). Thus, the two opposing views of financial innovation are similar to the two opposing views of EO, which are the 'EO-as-Advantage perspective' and the 'EO-as-Experimentation perspective' (Wiklund & Shepherd, 2011).

Researchers have indicated that it is important to examine entrepreneurship in a certain context (Shane & Venkataraman, 2001; Zahra & Wright, 2011). It is surprising that researchers have decontexualised EO or relied on 'general laws that transcend context' (Hjorth et al., 2008, p. 81). However, accounting for the contextual factors provides a clearer understanding of the examined constructs and theoretical considerations become better grounded in the context (Zahra & Wright, 2011). There are several benefits of incorporating context into EO research such as improving the realistic nature of EO, providing a grounded explanation for the relationship of EO with other variables, and enhancing the theoretical underpinnings of EO. Thus, in this thesis, the context becomes part of the story. As such, the financial crisis provides an ideal context to examine the EO-performance relationship.

We include the financial crisis in the timeframe (fiscal year 2000-fiscal year 2014) of this thesis, since not only do environmental factors affect EO, but also EO might affect the environment (i.e. a possibility is that EO might have contributed to the financial crisis) (Rosenbusch et al., 2013). We focus on the above years as the year 2000 witnessed a dotcom disaster in which several firms failed. This thesis aimed to capture the effect of EO on important firm-level outcomes along a period spanning from the pre-crisis to the post-crisis to measure the effect of the variation in EO across time on organisational outcomes. Thereby, we ensured that the observations of firms that have failed were after the fiscal year 2000 spanning across the 15-year period examined in this thesis.

There is a bidirectional relationship between EO and the environment with EO possibly influencing the environment, an aspect that should have been explored (Covin & Selvin, 1991; Miller & Friesen, 1982). Thus, it is necessary to examine the effect of EO on firm performance as well as survival in a severe environmental context such as the financial crisis. New revelations can be brought to light and such revelations might not be in line with the predominant view in the literature that EO is beneficial for firms.

2.6 Conclusions and Key Observations

The literature has shown that EO does not always lead to positive performance. In certain contexts (such as in family firms or unstable markets) EO does not uniformly lead to positive performance results. EO might even be linked to corruptive behaviours (Karmann et al., 2016).

The EO-firm performance literature has been plagued by a survivor bias. Most of the studies on EO ignored the possibility that EO might be associated with a higher risk of failure and did not examine the outcomes associated with such an exploratory risky behaviour among failed firms (e.g. Lomberg et al., 2017). Furthermore, the literature has continuously measured EO using the EO scale (e.g. Eshima & Anderson, 2017) which only captures the cross-sectional outcomes of EO, even though EO is a long-term orientation whose outcomes extend and are sustained over time (Covin & Slevin, 1991). This problem is exacerbated when the measurement of EO is based upon a scale that is administered to top managers. This scale would capture the managerial tendencies towards entrepreneurial behaviours but would not measure the actual entrepreneurial behaviours of firms. Not only is the operationalisation of EO a major drawback, but also entrepreneurial behaviours are assessed on short-term measures of firm performance. Gupta and Wales (2017) noted the limited attention given to the wide range of organisational outcomes of EO. Thereby, this thesis assessed EO against a long-term measure of firm performance since EO is a long-term orientation and must be assessed against a measure that captures the time effect. In addition, to capture the multi-dimensional nature of firm performance, this thesis included a short-term measure of performance as well.

This thesis explored the effects of the separate three dimensions of EO on firm performance and firm failure while keeping in mind organisational learning and prospect theory. Even though researchers have highlighted the importance of examining the risks associated with EO (Wiklund & Shepherd, 2011), no research has been conducted so far to challenge the EO-as-Advantage perspective. The thesis can be considered one of the few studies that aimed to challenge the conventional conception of EO, in which such conception coincides with the EO-as-Advantage perspective (Gupta, 2015).

This research has several contributions to the literature. Firstly, it included firms that have failed to challenge the EO-as-Advantage perspective. It also considered the effect of EO on firm performance, over time, across a significant time period from the pre-crisis to the post-crisis in the separate samples of surviving and failed firms. It objectively measured EO at the firm-level to signify the entrepreneurial firm-level behaviours. The thesis assessed the effect of EO across a wide range of organisational outcomes (short-term through return on assets/long-term firm performance through Tobin's Q). Furthermore, the thesis aligned with the multi-dimensional conceptualisation of EO, a conceptualisation that has been largely ignored by EO researchers, and examined the separate distinctive effects of each of the EO dimensions on various organisational outcomes. Lastly, the thesis contributes significantly to theory by evidencing the EO-as-Experimentation perspective, which originates from organisational learning theory.

By using insights into the EO-as-Experimentation perspective, this thesis separated the analysis of the firm performance outcomes of EO among the surviving and failed firms. Most importantly, this thesis examined the direct effect of EO on the risk of firm failure, which has not been examined in the EO literature. Not only is it important to examine the performance outcomes of EO on firm performance in the sample of failed firms, but also it is vital to examine the impact of EO on firm failure to provide empirical analysis and justification for the EO-as-Experimentation perspective.

The thesis explored the relationship of EO and performance and firm failure along a longitudinal timeframe, which includes a massive historical event such as the financial crisis. Thereby, the thesis addressed two main research questions: 1) What are the effects of EO and its dimensions on firm performance measures over time in the separate samples of surviving versus failed firms? 2) What are the effects of EO and its dimensions on the risk of firm failure? The first research question was addressed in Study 1 and second research question in Study 2.

It is, through this thesis, that a better understanding of EO in relationship to firm performance/failure would be achieved. It is surprising that the effect of EO on long-term firm outcomes, in the context of an economic crisis, has not been examined in the literature. Thereby, it is important to examine the performance outcomes of EO and its dimensions among surviving firms and failed firms separately (e.g. Lechner & Gudmundsson, 2014) and then to examine the effects of EO and its dimensions on the risk of firm failure. Only then, would new revelations be made with regards to the longitudinal outcomes of EO and its dimensions.

Chapter 3

Theoretical Framework and Hypotheses

3.1 Introduction to the Chapter

This chapter outlines the theories, with the research questions and hypotheses, that inform the anticipated effects of the overall EO construct/separate EO dimensions on firm performance and on risk of failure. Building on theory is important since it forms the building blocks or the foundations of the research endeavour. Data is only meaningful and subject to interpretation in the context of a certain theoretical foundation (Ahrens & Chapman, 2006). Thus, theory provides a framework for the research questions and hypotheses to be tested and puts the results of the research in context. Furthermore, theory centers upon the nature of causal relationships, whereby the predictor and outcome variables in a tested pathway are identified whilst considering the timing of events (Crossan et al., 2011).

The use of multiple theories is vital to further understand and provide comprehensive explanations for the relationships between the variables. This research achieves theory triangulation using organisational learning theory and prospect theory.

Most of the research on EO aligns with upper echelon theory, in which organisational outcomes reflect managerial behaviours and organisational decision-making rests upon the top management team (Carpenter et al., 2004; Hambrick & Mason, 1984). Thus, even though EO has initially been conceptualised as a firm-level behaviour (Miller, 1983), its measurements are at the managerial level. Thereby, this research utilised the EO-as-Experimentation perspective and re-conceptualised EO at the firm-level. The following thesis measured EO using firm-level proxies to directly depict the behavioural exhibition of EO by the sample of firms.

The first section will outline the research questions of Study 1 followed by the research questions of Study 2. Then, in the chapter, a brief section on the framing of the EO construct is presented. Later sections will outline the theoretical framework of this thesis, organisational learning theory and prospect theory. The EO-as-Advantage perspective is then presented and critiqued. Then, the EO-as-Experimentation perspective is outlined along with the hypotheses. Based on the theoretical framework of the thesis, the hypothesised effects of EO and its dimensions on firm performance among surviving and failed firms as well as on the risk of firm failure were generated. The hypotheses of Study 1 and 2 are presented in each of the sections 3.6 and 3.7.

3.2 Summary of the Theoretical Research Questions for Study 1 and 2

This section represents the research questions of Study 1 and 2. The over-arching research aim was to examine the effect of EO and each of its dimensions on performance indicators as well as on risk of failure. Based on the EO-as-Experimentation perspective, this thesis theorised different performance outcomes from EO in the sample of surviving firms and the sample of failed firms. The analysis of Study 1, on the effect of EO on firm performance, was conducted by separating the sample of surviving firms from failed firms. Study 2 focused on the effect of EO and each of its dimensions on the risk of firm failure in the overall sample.

The beginning of this section will outline the research questions for Study 1, followed by the research questions for Study 2. This will set the stage for the hypotheses of this thesis.

3.2.1 Research Questions for Study 1

The following section outlines the research questions for Study 1, which centers upon examining the relationship between EO and firm performance measures (short-term performance or ROA versus long-term performance or Tobin's Q) in a sample of surviving and failed firms.

Research Question 1: What is the effect of EO on short-term and long-term measures of performance among surviving firms?

Research Question 2: What is the effect of EO on short-term and long-term measures of performance among failed firms?

Research Question 3: What is the effect of each EO dimension on short-term and long-term measures of performance?

After outlining the research questions for Study 1, the following section will present the research questions for Study 2.

3.2.2 Research Questions for Study 2

The following study centers on examining the effect of the EO construct as well as its dimensions on the risk of firm failure. The research questions for Study 2 were:

Research Question 4: What are the effects of EO and each EO dimension on the risk of firm failure over time?

Research Question 5: What are the effects of higher levels of EO/EO dimensions on the risk of firm failure?

The next section will examine the framing of the EO construct before outlining the theoretical framework of this thesis.

3.3 Setting the Context of EO and Firm Performance/Risk of Failure

3.3.1 The EO Construct

The purpose of this section is to set the stage for the subsequent sections on the theoretical framework of this thesis. It is vital to emphasise the origins and the conceptualisation of EO as a firm-level behaviour. The EO-as-Experimentation perspective, which has guided this research is derived from organisational learning theory, a theory that is positioned at the firm-level.

EO was initially conceived as a strategy-making firm-level behaviour consisting of three dimensions: innovativeness, proactiveness, and risk taking (Miller, 1983). Furthermore, entrepreneurial behaviours are behaviours that are sustained over time (Covin & Slevin, 1991; Wales et al., 2011). Thus, there is a 'temporal stability or consistency' in the exhibition of entrepreneurial behaviours on a longitudinal basis (Anderson et al., 2015), yet researchers measure EO at one point in time by using the overly-used EO scales by Miller (1983) and Covin and Slevin (1989).

Even though researchers and the early conception of EO is set at the firm-level, the overly-used EO scales measure EO at the managerial level and capture the managerial opinions and attitudes towards entrepreneurial behaviours. Even more so, the EO scales have some items that refer to managerial attitudes rather than firm-level behaviours (Anderson et al., 2015). Thereby, even though researchers have defined EO as a firm-level behaviour, they have relied on the EO scale, which measures the proclivity of managers towards entrepreneurial behaviours, but this scale does not measure the firm behaviour. There is a difference between managerial attitudes and behaviours, the latter being an outcome of the manager's attitude. Thus, managerial tendency towards EO does not always translate into a behavioural manifestation as there might be constraints on the managers' attitudes (Anderson & Covin, 2014). This mis-alignment between the conceptualisation of EO and its measurement has caused a measurement malaise in the EO research. There is a need to re-position the origins of the EO construct as a firm-level behaviour (Covin & Slevin, 1989; Lumpkin & Dess, 1996; Miller, 1983) rather than a managerial disposition (Mintzberg, 1973).

3.3.2 Definition of Firm Failure

This thesis considered firm failure to be a complex outcome of a firm, in which market exit or discontinuity of operations is due to several reasons including discontinuity of ownership, bankruptcy, liquidation, and privatisation (Josefy et al., 2017). As such, firm failure is not only due to bankruptcy or insolvency even though bankruptcy or insolvency are clear indicators of failure (Josefy et al., 2017). Authors have not been consistent in their definition of failure. Some authors consider discontinuation of ownership as firm failure, whereas other authors consider the death of a business as the sole indicator of failure (Hughes et al., 2010; Josefy et al., 2017). Others only consider acquisitions of firms that are at risk of bankruptcy as a type of failure (Wiklund & Shepherd, 2011), whereas others exclude all acquisitions from the sample of failed firms (Revilla et al., 2016). Josefy et al. (2017) considered firm failure to be a multi-faceted phenomenon and to include discontinuation of ownership, bankruptcy, insolvency or liquidity (Josefy et al., 2017). In this thesis, the hypothesised relationships between EO and its dimensions and risk of failure are considered among the types of firms that failed due to discontinuity of ownership, bankruptcy, liquidity, and privatisation. Thereby, the hypothesised relationships are tested among all the samples of failed firms. However, similar to Wiklund and Shepherd (2011), this thesis discounted successful exits due to merger or acquisition from unsuccessful exits of firms that would have filed for bankruptcy had it not been for the acquisition to firmly ensure that the discontinuity of ownership represents a clear indicator of failure, which is similar to bankruptcy and insolvency. This ensured that the samples of failed firms could be combined to enable us to test the hypothesised relationships among the overall sample of failed firms.

After setting the origins of EO at the firm level and defining the dependent variable firm failure, the following sections will outline organisational learning theory and prospect theory subsequently.

3.4 Organisational Learning Theory

This thesis adopts organisational learning theory as its main theoretical framework, utilising a management science perspective, which examines the learning process relative to the assimilation and processing of information (Easterby-Smith, 1997). Organisational learning theory originated from behavioural decision theory of the firm (Cyert & March, 1963) and from March and Simon’s (1958) concept of bounded rationality. Organisational learning theory is related to behavioural decision theory in terms of predictions of changes in organisational behaviours and decision making in effect to experiences and firm aspiration levels (Argote & Greve, 2007). Organisational learning theory has been considered an important topic for both management researchers and practitioners (Harvey & Denton, 1999). This thesis considers and examines the process of learning at the organisational level and the different dimensions of organisational learning and their impact on firm-level outcomes. Organisational learning framework is appropriate for the examination of entrepreneurial explorative behaviours (Garcia-Morales & Llorens-Montes, 2006). The key question that this thesis aims to answer is whether entrepreneurial types of learning are vital factors in ensuring a firm’s survival (Easterby-Smith, 1997).

According to March (1991), exploration and exploitation are two different learning orientations and entail distinctive organisational approaches. Yet, within explorative learning, there are different dimensions that are involved in the process of acquisition of knowledge through exploration, engaging in generative learning, and challenging current practices by developing new behaviours (Dess et al., 2003; Slater & Narver, 1995). In this thesis, we examine and focus on the effect of explorative intra-organisational learning sub-dimensions (innovativeness, proactiveness, and risk taking) on firm performance, similar to previous researchers that adopt an intra-organisational ecological perspective (Burgelman, 1991). Intra-organisational learning processes are those that focus on learning that occurs within single formal organisations (learning that takes place within teams, groups, and departments) (Holmqvist, 2004). The focus is on the intra-organisational learning as it provides a majority of the experiential knowledge that may be transferred among organisations to be utilised in a collaborative network (Powell et al., 1996). As such intra-organisational learning may generate inter-organisational learning in a process termed ‘extension’, in which the knowledge and learning within an organisation is shared and translated to other organisations in a formal collaboration (Hamel, 1991).

Organisational learning theory considers that learning occurs at multiple-levels (individual, group, and organisational) (Cangelosi & Dill, 1965). Different levels of learning arise due to different definitions about what constitutes an “organisation” (Crossan et al., 1995). For instance, according to this study and in line with organisational-level theorists, an organisation is more than the sum of its organisational members, in which systems structures and procedures affect organisational learning (Fiol & Lyles, 1985). Organisational learning does not simply arise from individuals and groups, but from the holistic organisation, which has an important role as well (Fiol & Lyles, 1985; Huber, 1991; Levitt & March, 1988). Hedberg (1981, p. 6) noted that “it would be a mistake to conclude that organizational learning is nothing but the cumulative result of their members' learning… Organizations' memories preserve certain behaviors, mental maps, norms and values over time.” This is not to discredit learning that occurs at the individual or group level, but that learning goes through a process of institutionalisation and the learning becomes embedded and encoded within nonhuman elements such as systems, routines, artifacts and procedures of organisations (Crossan & Berdrow, 2003; Shrivastava, 1983). Thus, even though individuals within the organisation come and go over time, the learning becomes integrated within its knowledge storehouses or repositories (Crossan et al., 1995). The view that organisations learn independently from the actors that inhabit it stems from the field of cybernetics, which considers that organisations are self-regulating systems with their concern to control and maintain their conformity to the desired state of performance (Carver & Scheier, 1998; Morgan, 1986).

The management literature has *equated* organisational learning with "sustainable competitive comparative efficiency" (Dodgson, 1993, p. 376) or survival (Lipshitz et al., 2002). In the strategic management literature, organisational learning has been viewed as an innately positive organisational phenomenon that leads to a sustained competitive advantage (Perez Lopez et al., 2005). Organisations that are fast learners are able to distinguish themselves in the market (Crossan et al., 1995; Crossan & Berdrow, 2003; DeGeus, 1988; Dodgson, 1991; Edmondson & Moingeon, 1998; Stata, 1989). Furthermore, irrespective of examining the separate underlying pathways of organisational learning, it is assumed that organisational learning improves future performance as it leads to new sources of capability (Fiol & Lyles, 1985). Yet, it is vital to break away from the assumption that organisational learning produces utopian outcomes (Crossan & Berdrow, 2003). As Levitt and March (1988, p. 335) stated, "learning does not necessarily lead to intelligent behavior". Organisational learning may hinder firm performance since past learning held within existing systems and structures may prevent the firm from exhibiting different divergent behaviours that may be useful for the firm in the future (Crossan et al., 1995). Furthermore, learning may not lead to expected improved performance as forgoing past existing strategies for new and unfamiliar methods of operation is risky and can lead to erroneous errors (Levitt & March, 1988; March & Olsen, 1975). Most of the organisational learning literature has focused on the theoretical development of the conceptual framework of organisational learning rather than empirically investigating the impact of organisational learning (Vince et al., 2002).

At the heart of organisational learning theory lies a distinction of explorative and exploitative activities (March, 1991). There are primarily two types of learning: transformational (explorative) and incremental (exploitative) (Crossan et al., 1995). This mirrors the classification by Fiol and Lyles (1985) of "lower" level learning and "higher" level learning. Similarly, Senge (1990) differentiates between "adaptive" and "generative" learning. Furthermore, Dodgson (1991) terms the two types of learning: "tactical" and "strategic".

Exploration is synonymous with experimentation, risk taking, discovering, innovating, searching, and variability. Exploitation is synonymous with activities that are refining, selective, reliable, logical, and efficiency-producing over effectiveness (Crossan & Berdrow, 2003; Holmqvist, 2004; March, 1991, 2006). Exploitative learning involves incremental changes with the refining and routinizing existing strategies and generates reliable results (Crossan et al., 1995; Holmqvist, 2004). While, explorative or transformation type of learning involves learning in areas outside of existing strategies, creating, and experimenting to generate significant changes in current strategies or behaviours (Argyris & Schon, 1978; Crossan et al., 1995).

According to organisational learning theory, EO is associated with exploratory activities rather than exploitative learning activities since it centers on creative experimentation, novelty or innovativeness, proactive searching and involves high risks and trialling (Crossan et al., 1999; Holmqvist, 2004; Hughes et al., 2007; Wiklund & Shepherd, 2011). Thus, entrepreneurial behaviours entail exploratory learning, in which the learning mechanisms at the firm-level are promoted by actively searching the environment (Garvin, 1993).

The distinction of explorative and exploitative learning builds on the possible returns, in which explorative and exploitative activities produce diverse performance outcomes over time (March, 2006). Exploitative activities have certain incremental returns at little cost and have more proximal and predictable outcomes. Conversely, explorative activities have less certain returns and are distant in time (Fiol & Lyles, 1985) and 'often' lead to 'negative outcomes' (March, 1991, p. 85). Essentially, when explorative learning leads to a successful outcome, it is the result of trial and error. Since there is 'trialling' and experimenting in the process, this leads to higher variability in outcomes with the possibility of success as well as failure (March, 2006; Wiklund & Shepherd, 2011). Evidence from the literature has shown that a relative explorative orientation has an inverted U-shaped relationship with firm financial performance (Uotila et al., 2009).

Firms may engage in explorative risky behaviours as a result of being displeased with the production of incremental returns due to an excessive focus on refining their strategies (March & Simon, 1958). In this case, firms are trigged to engage in a process termed ‘opening-up’, which involves the process of moving from the state of repetitive routinization to a state of exploration and experimentation (Hamel, 1991) in order to be more responsive to the changes in the environment (Dodgson, 1993; Meyers, 1982). The motivation for the opening-up process is driven by below minimum aspiration levels of performance (Holmqvist, 2004). Thus, explorative learning or higher-level learning involves the use of decision heuristics and insights and its outcomes may entail dysfunctional behaviours (Fiol & Lyles, 1985). It is this constant focus on explorative learning that tends to trap firms in a failure trap that drives performance to lower levels needed for survival and the eventual failure of a firm (Levinthal & March, 1993). When firms reach below-aspirations levels of performance they tend to engage in more exploration and take more risks by drastically changing their current strategies and re-orienting themselves to re-gain their viability or survival (Hambrick & De’Aveni, 1988). When faced with crisis situations, firms engage in more exploratory risky behaviours, which reduces their life expectancy (March, 1981). As stated by March (1981, p. 567): “"for those organizations that do not survive, efforts to survive will have speeded the process of failure." Such a re-orientation of the firm to focus on exploration eliminates the cumulative learning of the firm and entails “betting the organisation” (Burgelman, 1991, p. 255).

Certain learning mechanisms tend to place an importance on achieving the organisational goals in the short-run. Learning strategies that are effective in the short-run will not necessarily guarantee survival in the long-run (Levinthal & March, 1993). Sustaining explorative behaviours over time is a problem that is heightened with learning rather than relieved. Levinthal and March (1993) termed the difficulty of sustaining explorative learning behaviours over time: the temporal myopia (tendency to overlook possible futuristic outcomes) and the myopia of failure (proclivity to under-estimate risk of failure). Explorative behaviours are likely to lead to unsuccessful outcomes, but are the only way that firms can be able to take the lead in the market and to ‘finish first’ (Eisenhardt, 1989; Levinthal & March, 1993).

As stated by March (1991), firms that engage in explorative endeavours at the expense of exploitative activities would not reap benefits from being explorative as explorative activities are stochastic and whose outcomes cannot be predicted. As such, even though explorative activities prevent firms from being trapped within the status quo (i.e. ‘competency trap’ or ‘lock-in through learning’), they might drive the firm into exploring new activities without building upon their existing competencies (Levitt & March, 1988). Thus, seeking out opportunities and delving into explorative endeavours lead to a cascade of new ideas and hamper the development of existing strategies (March, 2006). Yet, a focus on exploitative activities (an over-reliance on outdated procedures) leads to sub-optimal performance and might be ‘self-destructive’ since it ultimately results in stagnation (March, 1991, p. 73; Uotila et al., 2009).

Lant and Mezias (1990) considered that there are three components to a learning model, which was influenced by Cyert and March’s (1963) behavioural theory of the firm and which uses insights from prospect theory (Kahneman & Tversky, 1979): First organisations have a target level of performance that they use as a reference to compare their current performance to. Second, the level of the current performance above or below the aspired target would influence the probability of organisational change. Lastly, the organisation utilizes the learning model to process information and assess alternatives, which is relatively a costly process of search for the firm. Thus, firms engage in forward-looking generative types of learning in order to reduce the perceived uncertainty between the amount of information needed and the information already possessed to perform a certain task (Galbraith, 1977). Generative learning becomes the focus of the organisation in an uncertain or ambiguous environment as it allows firms to restructure their existing norms and strategies (Argyris and Schon, 1978; Dodgson, 1993).

The next section will outline prospect theory, since insights into the effect of EO on organisational outcomes can be derived from prospect theory as well (March, 1991; Slevin & Terjesen, 2011). Prospect theory is a behavioural economic theory that explains the reasons firms choose to engage in certain behaviours based on the potential probabilistic gains or losses. This is similar and follows the same logic of the learning model (Lant & Mezias, 1990). We use prospect theory to theorise how failed firms engage in entrepreneurial behaviours in comparison to surviving firms (Kahneman & Tversky, 2000). Prospect theory was used to derive some of the hypotheses in this thesis, *H1, H3,* and *H7(a, b, and c)* and *H8(a, b, and c),* that will be outlined in section 3.6.

3.5 Prospect Theory

Prospect theory is a behavioural decision theory that was developed to explain the individual decision making towards risk attitudes (Kahneman & Tversky, 1979). Yet, there are several researchers that have extended prospect theory to organisational decision making (e.g. Bowman, 1982, 1984; Fiegenbaum, 1990; Fiegenbaum & Thomas, 1988). Prospect theory has emphasised the role of target or reference levels in examining outcomes from risk taking behaviours and proactive behaviours (Crant, 2000; Feigenbaum & Thomas, 1988). The concept of aspiration levels was derived from organisational decision making and limited rationality behavioural theories (Cyert & March, 1963; March & Simon, 1958; Simon, 1955, 1979, 1991). It is termed prospect theory because firms reduce each alternative in the decision making process to a set of prospects and evaluate each of the prospects based on the firms' reference value (Fiegenbaum, 1990). In evaluating prospects, firms use decision heuristics and biases to assist in the decision making process, which suffers from high levels of uncertainty and may even lead to severe systematic errors and biases in interpretation (March, 1991; Nelson & Winter, 1982; Tversky & Kahneman, 1974). The process of engaging in entrepreneurial behaviours produces unknown outcomes (Knight, 1921). When faced with distress, firms prefer a significant greater loss from entrepreneurial behaviours with an uncertain probability of success to a marginal loss from risk-averse behaviours with certain returns (Kahneman & Tversky, 1979).

The theory predicts that firms can be classified either as risk-seeking or risk-averse based upon their performance relative to a reference value (Kahneman & Tversky, 1979). In this thesis, we extend to consider that prospect theory is useful in predicting the degree of exhibition of entrepreneurial behaviours among failing troubled below-performing firms versus surviving firms. Furthermore, we consider that when entrepreneurial behaviours are deconstructed into its elements of innovativeness, proactiveness, and risk taking, prospect theory can explain elements of risk and uncertainty attached to the proactive forward-looking behaviours and risk taking behaviours (Bowman, 1982; Crant, 2000). Proactiveness and risk taking, according to prospect theory, operate based upon reducing the discrepancy between the current situation and a desired unknown futuristic state (Kahneman & Tversky, 1979).

Prospect theory, a descendent of limited rationality behavioural theories (Cyert & March, 1963; Simon, 1955), is intersected with organisational learning theory in that it is a theoretical framework that predicts organisational change and search and the outcomes associated with 'problematic motivated search' (Argote & Greve, 2007; Singh, 1986). That is, organisational change and a bias towards exhibiting and enacting entrepreneurial behaviours is triggered from the current levels of organisational performance in comparison to aspiration levels (Cyert & March, 1963; March, 1988). If organisational performance falls below desired satisficing levels, organisations commence on their proactive search for innovative solutions and strategies with high levels of uncertainty (Kahneman & Tversky, 1979; March & Simon, 1958; Singh, 1986; Winter, 1971). Thus, organisational proactive search is myopic and the search that was intended to address the current situation in actuality might enhance the organisational demise (Lant et al., 1992; Singh, 1986; Staw et al., 1981). In relation to organisational learning theory, this is similar to the problem of balancing exploration and exploitation strategies/behaviours (March, 1991; Morgan & Berthon, 2008). Due to organisational distress, a sole focus on exploring new alternative strategies would affect the organisational competence building on existing strategies and affect the organisational survival as returns from exploration are less certain and more remote in comparison to exploitation (Levitt & March, 1988). According to prospect theory, firms are likely to be exhibiting a focus on entrepreneurial behaviours and risk seeking and producing strategies when their returns are below target levels, whereas they are likely to be more risk averse when their returns are above target levels (Fiegenbaum & Thomas, 1988).

In essence, previous researchers have noted that the assumptions of organisational learning theory can be extended to prospect theory (Slevin & Terjesen, 2011), in which firms must make the choice between risky explorative and conservative exploitative strategies using techniques of abstraction (set of alternative actions or models of situations), historical data (historical information of organisations), and decision rules (a set of alternative decisions based on expected outcomes) (March, 1991, 2006). Such decision rules are set by firms based upon their performance relative to a reference point. Firms that are performing above that reference point are more likely to engage in exploitative strategies and to be risk-averse despite available opportunities (Singh, 1986) . This could entail that firms that have survived, which are better-performing in comparison to failed firms, would less likely engage in exploratory risky activities (Fiegenbaum, 1990). Interestingly, failed firms have been shown to have high EO, a risky explorative strategy (Wiklund & Shepherd, 2011).

There are four hypotheses or predictions set within prospect theory: 1) reference value points are central for determining the firm decision, 2) under-performing firms exhibit a negative risk-return relationship, 3) over-performing firms exhibit a positive weaker risk-return relationship, and 4) the risk-return relationship of below-target performing failing firms is more negative and steeper (stronger in magnitude) in comparison to over-performing surviving firms that are in the gain domain (myopic loss aversion phenomenon) (Fiegenbaum, 1990).

One of the main cornerstones of prospect theory, myopic loss aversion, posits that firms are probably more risk-averse to strategies that have an immediate return and are frequently assessed. Alternatively, firms are more likely to be risk-seeking to decisions that have less certain proximal returns and are evaluated less frequently (Benartzi & Thaler, 1995) . Thereby, myopic loss aversion predicts that firms are more likely to adopt a conservative strategy for decisions that lead to short-term earnings. On the other hand, firms are likely to adopt a risky strategy for decisions that are of a long-term nature (Tversky & Kahneman, 1991). This could entail that firms engaging in an entrepreneurial behaviour, which is a behaviour of a long-term nature and whose returns are uncertain, would be more inclined to take higher risks and be subject to a higher mortality rate. Thereby, according to prospect theory, failed firms would engage more in EO. This is associated with exploratory behaviours since the outcomes of EO are uncertain and have a long-time horizon(March, 1991, 2006) . The continuous engagement in 'exploratory foolishness' is the result of trial and error in the adaptive process based upon the assumption that exploratory endeavours (i.e. EO) would foster growth and profitability (March, 2006).

The next section will outline the theoretical framework for the hypothesised relationships between EO and firm-level outcomes. The beginning of the following section will critique the EO-as-Advantage perspective, the dominating theory of the EO-performance relationship. Then the section will present the EO-as-Experimentation perspective.

3.6 EO-as-Advantage versus EO-as-Experimentation

The following section represents the two opposing views in the literature on the EO-firm performance relationship, the EO-as-Advantage perspective and the EO-as-Experimentation perspective. The EO-as-Advantage view is derived from the Resource-based view (RBV), whereas the EO-as-Experimentation view is derived from organisational learning theory. The beginning of the section will present the EO-as-Advantage perspective.

3.6.1 EO-as-Advantage Perspective

Most of the literature on EO adopts the EO-as-Advantage perspective and poses that EO has a positive effect on firm-level outcomes (Wiklund & Shepherd, 2011) (the most researched outcome being firm performance) (Rauch et al., 2009).

Barney (1991) first noted that a resource or a capability must meet four requirements to ensure that value is captured and created from the resource. The requirements are that a resource is rare, valuable, inimitable, and lastly that the organisation is organised to take advantage or exploit the resources (VRIO framework) (Wiklund & Shepherd, 2003). The EO-as-Advantage perspective considers that EO, as a rare and valuable resource, is advantageous for firms and provides them with a 'sustainable differentiation' and competitive advantage, which leads to a higher relative performance (Wiklund & Shepherd, 2003, 2011).

Furthermore, the EO-as-Advantage perspective considers that EO is an inimitable resource, which causes the competitive advantage of EO to be sustainable over time. The notion of EO as a resource or capability was framed by Newbert (2007), whereby EO allows firms to leverage or bundle their resources to achieve a sustainable competitive advantage (Ireland et al., 2003). The conception of EO as a performance-enhancing resource has been adopted by most researchers who tend to focus on the advantageous effect of EO disregarding the risks associated with such a strategic organisational orientation (e.g. Wiklund & Shepherd, 2003).

A resource is an input into the production process and can be either a tangible property-based or an intangible knowledge-based resource. It is through the knowledge-based resources that firms can transform and leverage the property-based resources to build a competitive advantage. Thus, the knowledge-based resources are rare, valuable, and inimitable and are essential for firms to exhibit entrepreneurial behaviours that are sustainable (Wiklund & Shepherd, 2003). According to RBV, EO can be considered as a critical resource or a capability (Newbert, 2007) that is performance-enhancing by organising and focusing on the knowledge-based resources to explore new opportunities, to experiment with new technologies and products, and to enter new external markets (Wiklund & Shepherd, 2011). As coined by Alvarez and Busenitz (2001), EO has been an 'intricate' construct of the resource-based theory.

There have been concerns with the resource-based theory. One of those main concerns is methodological in nature, in which the empirical analysis required to reveal EO as a resource that achieves a sustained competitive advantage requires a longitudinal analysis. Yet, a longitudinal analysis is absent from the literature on EO, which has argued for the competitive advantage of EO over time by using the RBV theory (Barney et al., 2001). Thus, cross-sectional studies, which dominate the EO research, are flawed by being static and not revealing causal relationships (Priem & Butler, 2001). Furthermore, there is an inherent problem in the measurement of unobservable intangible resources. This raises a concern in the testability of the RBV theory (Barney et al., 2001). Thereby, researchers divert to using observable variables to capture the unobservable constructs (e.g. intangible resources).

There is also an issue with the depiction of EO as a resource. EO is a behavioural action of a firm and is an opportunity seeking behaviour, whereas a resource is the input into the production process and might not necessarily convert into a value-creating behavioural outcome. There is a mis-specification problem in the unit of analysis of EO by attributing an input property (i.e. a resource property) to a behavioural construct (EO). This issue raises concerns on RBV since a fundamental concept to the theory is that EO is a value-creating and performance-enhancing resource (Priem & Butler, 2001; Wiklund & Shepherd, 2005).

To provide more insights into the wide range of outcomes of EO and its dimensions over time, the EO-as-Experimentation perspective was used. The next section will present the EO-as-Experimentation perspective, the alternative positioning of the EO-firm performance relationship.

3.6.2 EO-as-Experimentation Perspective

In contrast to the EO-as-Advantage perspective, the EO-as-Experimentation perspective builds upon the distinction between explorative and exploitative strategies and originates from organisational learning theory (March, 1991; Winter, 1971). Firms may choose either to venture into new explorative activities or to engage in exploitative activities that involve refining or building upon existing competencies (Dodgson, 1993). The EO-as-Experimentation perspective considers that the range of outcomes from EO is broad and this might include possibility of failure (failure trap) (Levinthal & March, 1993). The EO-as-Experimentation considers that EO is a variance-seeking strategy since it involves exploratory innovative, proactive, and risk taking behaviours characterised with uncertainty (Slater & Narver, 1995). Firms might benefit from such behaviours or might adversely fail from losses (Levitt & March, 1988; March, 1988). Thus, EO might result in larger outcome variance, by increasing chances of both success and failure (Burgelman, 1991). Over a three-year period Wiklund and Shepherd (2011) found that levels of EO were high among failed firms. Thus, there is a possibility that either EO was a last resort to resurrect their business or it could entail that EO was a promoting factor leading to their failure (Slevin & Terjesen, 2011). Risk taking has been noted as a potent factor that might enhance firm failure, yet certain other dimensions of EO, if excessive, might entail the risk of higher rates of failure as well (Levinthal & March, 1981; Hill & Snell, 1989; Slater & Narver, 1998). This is coherent with the early conceptualisation of EO, which places emphasis on the novelty and risk-bearing aspects of EO that by extension can carry outcome uncertainty and hence the potential for failure (Lumpkin & Dess, 1996). However, since most of the literature on EO has not included failed firms in their sample (Rauch et al., 2009), this has led to a bias towards insinuating a positive EO-firm performance relationship.

The EO-as-Experimentation perspective posits that the risk bearing effect of EO is not being captured in the literature. Firms that exhibit lower levels of EO might be more risk averse and probably have an ingrained ‘anti-failure’ belief (McGrath, 1999). According to the EO-as-Experimentation perspective and prospect theory, firms that have survived and have a higher relative performance are more likely to engage in conservative risk-averse strategies (Hambrick & De'Aveni, 1988; Kahneman & Tversky, 1979; March, 1981). Firms have a decision rule to choose between exploration and exploitation. Such rules consider the alternative behaviours based on the best anticipated outcomes. Thereby, the actions of firms are set by expectations of futuristic outcomes (Barnett & Burgelman, 1996). Failed firms are more likely to engage in risky strategies in comparison to surviving firms. Historical data contains cases of technologies that have initially supported experimentation and risk taking with the expectation that they offer great value (Albin & Foley, 1998). Thus, according to the EO-as-Experimentation perspective as well as prospect theory, failed firms are more likely to engage in exploratory risky behaviours in comparison to surviving firms (Bowman, 1982). The first hypothesis was based on organisational learning theory (in section 3.4) and prospect theory (in section 3.5) and predicts that:

H1: Failed firms are more entrepreneurially oriented in comparison to surviving firms.

The hypothesised outcomes from EO, according to the EO-as-Experimentation perspective and organisational learning theory, arise from its association with exploratory endeavours that involve venturing into new arenas and entail a higher risk (March, 1991). According to the EO-as-Experimentation, EO is inherently related with explorative behaviours since it involves experimenting, entering new markets, and trial and error behaviours rather than refining or committing to existing strategies (Day, 1994; Holmqvist, 2004; Levitt & March, 1988; Marengo, 1993).

The EO-as-Experimentation perspective theorises that EO can increase performance variance, in which exploratory behaviours might have the probability of success as well as failure (Burgelman, 1991; March, 1991). EO is associated with strategies that are explorative in nature, rather than conservative strategies, and are characterised by being distant from the firm competencies, possibly leading to uncertain outcomes (Levinthal & March, 1993; March, 1991).

Considering that a minimum performance level is needed for survival, EO, as an exploratory behaviour, might positively affect performance up to a threshold for surviving firms (Levinthal & March, 1981; March, 1991; Miller & Friesen, 1982). That is, based on the EO-as-Experimentation perspective, EO is characterised by having a double-edged nature, in which certain exploratory activities might result in either 'home-runs' or 'losses/strikeouts' (Wiklund & Shepherd, 2011). Thereby, according to EO-as-Experimentation, EO results in a performance variance, whereby surviving firms are predicted to have entrepreneurial ventures resulting in a better performance in comparison to failed firms whose entrepreneurial efforts might not materialise into a positive performance outcome (Burgelman, 1991; March, 1991). Drawing theoretical arguments from organisational learning theory and the EO-as-Experimentation perspective, we hypothesise that surviving firms experiment more effectively and achieve better outcomes as a result of pursuing EO in comparison to failed firms. According to organisational learning theory, even though EO might provide better outcomes in the sample of surviving firms, such benefits would be outweighed by the costs of increasing levels of EO (Levinthal & March, 1993; March, 1991) in which firms are likely to over-estimate the returns due to their exploratory risky strategies (March & Shapira, 1987).

According to organisational learning theory, EO is an exploratory risky strategy and with increasing levels of exploration, the returns from EO may be over-estimated and the problems and complexities in the process of entrepreneurial learning may be under-estimated and this results in a higher negative outcome (Dodgson, 1993). This entails that low to moderate levels of EO might be associated with a better-performing surviving firm, in which excessive levels of exploration would negatively impact a firm (March, 1991). Drawing theoretical insights from organisational learning theory, surviving firms that excessively pursue an entrepreneurial risky orientation are in effect over-estimating the positive outcomes that have resulted from EO and under-estimating the likelihood of negative outcomes from EO (Levinthal & March, 1993; March & Shapira, 1987). Historically, it has been shown that there are cases of firms that have supported a risky entrepreneurial endeavour in the promise of a predicted positive value, yet the positive predicted values failed to materialise (Albin & Foley, 1998). Thus, according to organisational learning theory, surviving firms excessively pursue EO once historically it has been shown to result in a realised value (Barnett &

Burgelman, 1996). Yet, with increasing levels of EO, surviving firms are essentially undertaking more risks and subjecting themselves to greater probability of a poor performance (March, 1991). He and Wong (2004) explain that firms should not be overdependent on explorative behaviours. Thus, according to organisational learning theory, it is posited that in a sample of surviving firms, EO might increase performance until a threshold point. Yet, as EO increases beyond that threshold, firm performance of surviving firms decreases. Thereby, it is hypothesised, according to organisational learning theory that:

H2: The relationship between EO and (a) short-term and (b) long-term firm performance among surviving firms is an inverted U-shaped relationship.

According to the EO-as-Experimentation perspective and prospect theory, failed firms, which might have engaged in higher levels of risky entrepreneurial strategies in comparison to surviving firms, are more likely to have experienced a negative performance outcome as a result of being more entrepreneurially oriented (Levitt & March, 1988; Kahneman & Tversky, 1979). EO holds potential to be a 'double-edged sword': the emphasis on risk-taking, novelty, and moving proactively towards uncertain future markets can increase the costs in the event of such actions failing to materialise (Wiklund & Shepherd, 2011).

According to organisational learning theory, since EO is associated with explorative risky and experimental activities, by undertaking more exploration and experimentation, firms subject themselves to higher risks of negative outcomes (March, 1991). In contrast to the sample of surviving firms, according to the EO-as-Experimentation perspective, EO might lead to negative outcomes in the sample of failed firms and contribute to the possibility of failed firms performing below that minimum performance level needed for survival (Burgelman, 1991; Staw et al., 1981). We predict, according to the EO-as-Experimentation perspective, that in the sample of failed firms, which might be engaging more in experimentation and exploratory risky behaviours, EO has a negative effect on their firm performance. Thereby, it is hypothesised according to organisational learning theory and prospect theory that:

H3: The relationship between EO and (a) short-term and (b) long-term firm performance among failed firms is negative.

According to the EO-as-Experimentation, entrepreneurial behaviour carries high risks and it would negatively affect firm survival (Wiklund & Shepherd, 2011). That is, not only are higher EO levels associated with lower performance, but also EO might lead to higher risks of failure . That is, EO requires considerable access to resources and some firms may not be successful in its implementation (Covin & Slevin, 1991). Firms that engage in unconventional novel exploratory behaviours at the expense of exploitative behaviours are forgoing the reliable stable observable outcomes for uncertain outcomes that are characterised by a higher probability of failure (Burgelman, 1991; Fiol & Lyles, 1985; March, 1981). Exploratory behaviours lead to uncertain outcomes and are characterised by a 'low success rate', in which successful outcomes from EO are achieved through error in the process and this error generates greater variation (larger variance in returns) (March, 2006). Essentially, EO would more likely result in more self-destructive disasters rather than successful discoveries with its extensive explorative strategies (Levinthal & March, 1993). The exploratory strategy that would identify new avenues for growth might also contribute to higher probabilities of failure. This is because firms might over-estimate the value of pursuing an entrepreneurial orientation (March & Shapira, 1987). Even though EO might provide a competitive advantage for some firms, it might also lead to higher rates of failure as a result of errors of estimation (Dodgson, 1993; Levinthal & March, 1993). Over time there is a trade-off to an over-reliance on an exploratory strategic orientation at the expense of an exploitative orientation, in which 'exploratory foolishness' is unlikely to sustain positive outcomes and such outcomes are only the result of errors in the adaptive process (March, 2006). Based on the EO-as-Experimentation perspective, we hypothesise that firms with higher EO levels, in comparison to other firms, have higher rates of failure and that EO has a positive effect on the hazard of failure (Burgelman, 1991; Levinthal & March, 1993; Levitt & March, 1988). Thus, the hypothesis, according to organisational learning theory and the EO-as-Experimentation perspective, is:

H4: The relationship between EO and the risk of firm failure is positive over time.

In the context of a changing environment, especially R&D intensive industries, firms must alternate between exploitative and explorative strategies to achieve successful outcomes (March, 1991). Yet, in the high-technology context, firms are subjected to frequent technological changes, which cause a firm's existing competencies to be obsolete and in turn force such firms to continuously engage in exploratory 'technology-push' activities on the assumption that they would be more profitable (Eisenhardt, 1989; Levinthal & March, 1993; Morgan & Berthon, 2008). Thus, the constant changes in the environment force firms to revert to a risky explorative entrepreneurial orientation rather than a stable exploitative orientation (Garud & Nayyar, 1994; Lant et al., 1992). The constant exploration of new strategies and technologies leads to higher variability and higher rates of mortality. This sole focus on explorative entrepreneurial activities traps the firm in an endless cycle that leads to failure as a result of searching and experimenting, yet that failure leads to more searching and changing (Levinthal & March, 1993). In the above previous paragraph, we postulated that EO enhances the risk of failure. Thereby, since the high-technology industry is more entrepreneurially-oriented, it would have a lower survival probability in comparison to other industries. It is hypothesised, according to organisational learning theory, that:

H5: High-technology industry is more entrepreneurially oriented and has a lower survival probability in comparison to other industries.

After exploring the role of the EO-as-Experimentation perspective to provide a theoretical context for the hypothesised relationship between EO and firm performance/failure, the next section will consider the differential effects of each of the EO dimensions among themselves, according to the multi-dimensional conceptualisation of EO (Lumpkin & Dess, 1996). In addition, the anticipated distinctive effects of each of the EO dimensions on organisational outcomes based on organisational learning theory will be presented.

3.7 The Separate Effects of the EO Dimensions

Lumpkin and Dess (1996) theorised that each of the EO dimensions have opposing effects on firm performance, a striking difference from Miller (1983) gestalt conceptualisation of EO. Even though this thesis examines the effect of the EO dimensions as well as the overall EO construct on firm-level outcomes, it aligns with the multi-dimensional conceptualisation of EO and theorises that there are distinct effects between the EO dimensions on a similar firm-level outcome. The thesis also considers that there are different effects for each of the EO dimensions when assessed on several firm-level outcomes (i.e. short-term or long-term performance and risk of failure).

We hypothesise that the process of learning differs among the separate dimensions of EO and that in effect they would have opposing effects among themselves and on different performance outcomes. On the other hand, the interaction among the EO dimensions, as an overall EO construct, exhibits similar effects on the performance outcomes. The difference lies in the effect of EO on the different samples of surviving and failed firms as hypothesised in the above sections (*H2* and *H3*).

According to organisational learning theory, different types or sub-dimensions of explorative learning (innovativeness, proactive learning, and risk taking) will lead to different performance outcomes as each involves a unique learning process. In summary, certain explorative behaviours may benefit the firm, whereas other explorative behaviours may not. Even though, according to organisational learning theory, explorative learning is riskier than exploitative type of learning, the benefits in the long-run are in generating new competencies and new knowledge bases (this type of explorative learning is termed innovativeness). Whereas the long-term risks of explorative learning are present among the risk taking and proactiveness dimensions. The below sections will explain the differences among the EO dimensions in terms of their anticipated effects on firm performance outcomes.

This section will outline the hypothesised effects of each EO dimension (innovativeness, proactiveness, and risk taking) on organisational outcomes (short-term performance, long-term performance, and risk of failure).

3.7.1 Innovativeness

Innovativeness not only involves technological product innovation, but also organisational learning processes that stimulate innovative activities (Kanter, 1984). At the organisational-level, firms must move away from their current prevailing core practices and routines in order to explore new possible avenues (Garud & Nayyar, 1994), to successfully enact novel innovative solutions or new ideas (Calantone et al., 2002; Crossan et al., 2011), and to create and integrate new information and knowledge on products and processes (Burgelman & Sayles, 1986; Huber, 1991; Hurley & Hult, 1998). Innovative learning is the dimension of organisational generative learning that leads to the development of new knowledge, which reduces the probability that a firm's existing competencies would become obsolete and allows firms to remain dynamic and improves their performance in the long-run (Fiol & Lyles, 1985). The explorative innovative behaviours are driven by generative learning processes (Morgan & Berthon, 2008) that encourage the firm to move away from its 'limited core world view' (Brown & Duguid, 1991).

New learning opportunities for firm advancement either arise internally or externally (Garud & Nayyar, 1994). Despite the fact that internal and external technologies are important, external acquisitive technologies cannot solely maintain a sustained competitive advantage (Barney, 1991; Zahra et al., 1999). Internal experimental learning technologies are not accessible to other firms and allows firms to possess state-of-the-art technology (Garud & Nayyar, 1994; Lei et al., 1996). Innovativeness, a dimension of EO, is defined as trial-and-error learning in volatile knowledge forms and in fostering technological leadership by engaging in experimentation and creativity and investing in R&D activities (Miller, 1983; Thomke et al., 1998). The innovative activities that are run by formal R&D departments in firms are the major source of institutionalised intra-organisational learning in terms of promoting technological developments (Dodgson, 1993; Mowery, 1981). Innovative learning occurs through the firm-level organisational investments in R&D activities (Dodgson, 1993), which lead to enhanced internal improvement of the firm by new knowledge flows and the identification and integration of new discoveries (Zahra et al., 1999). As shown by Thornhill (2006), a greater R&D intensity is indicative of higher innovation. Even though a higher R&D intensity might not translate to successful innovations, firms that invest more in R&D are more likely to be highly competitive (Lin et al., 2006). Cohen and Levinthal (1990) stated that R&D generates and facilitates innovative learning, which in turn enhances the organisational capabilities in identifying and using external new information. Furthermore, the incentive for engaging in innovative learning influences R&D spending at the organisational-level (Cohen & Levinthal, 1989). In the context of high-technology firms, innovation is a central element to ensure firms remain competitive in a fast-changing industry (Chan et al., 1990). Innovativeness is vital for firm survival in an intensive competitive environment such as the high-technology industry (Audretsch, 1995; Zahra, 1996) and should be a priority for a firm that aims to remain competitive in today's changing market (Zahra & Garvis, 2000). The high-technology industry is constantly changing and is characterised by being dynamic. Thereby, firms are forced to be innovative to stay ahead of the competition and secure first-mover advantages (Lumpkin & Dess, 1996).

Innovativeness has been viewed in the literature as a firm-level behaviour that leads to a competitive advantage through creating differentiation and supporting adaptability to changing market conditions (Droge et al., 2008; Hughes & Morgan, 2007). Innovative learning leads to the development of new products and process efficiencies which ultimately lead to superior performance in the long-term (Burgelman & Maidique, 1989; Hall, 1999; Roberts & Amit, 2003). Thereby, the majority of the literature was shown to consider innovativeness as a performance-enhancing strategy (Walker, 2004). Innovativeness requires significant capital and expenditure of resources, such that R&D is considered to be a costly process for small firms that lack the required capital (Schumpter, 1942). However, innovativeness in large firms has a vital role in halting failure or reversing events of failure (Mckinley et al., 2014). Cefis and Marsili (2005) found that innovative firms had survival times 11% higher than non-innovative firms. Technological and knowledge accumulation is central for firms to achieve and maintain competitiveness in an uncertain challenging environment (Dodgson, 1991), such that innovative learning reduces uncertainty and shifts the dynamics of competition in favour of the innovative firm (Han et al., 1998). Through experimental innovative learning, firms can maneuver in a more effective and efficient manner and enhance their ability to respond to the uncertain environmental situation (Grant, 1995; Nonaka, 1994). Firms with greater capacity for innovative learning will develop knowledge-based resource capabilities that are required to improve their long-term performance and to achieve a sustained competitive advantage (Hurley & Hult, 1998). Innovativeness represents a generative learning orientation and the foundational element that leads to a long-lasting competency (Calantone et al., 2002; Sinkula et al., 1997).

According to organisational learning theory and the competency-based approach to competition, innovative intra-organisational learning is placed at the core of the learning process (Prahalad & Hamel, 1990; Zahra et al., 1999). Derived from the evolutionary perspective of the firm, innovative learning allows firms to develop and deploy unique resources, which are necessary to ensure organisational survival (Nelson & Winter, 1982). Firms that are high in innovative learning continuously develop new products and services that allows them to develop new competencies and to sustain their developed competencies. Thus, to survive firms must continuously engage in innovative learning (Day, 1994; Zahra et al., 1999).

Cohen and Levinthal (1989) state that R&D investments and the learning process through innovativeness is a costly process, in that its cost of learning is 'immediate' and are offset by the benefits in the 'long-term' (Dodgson, 1993). Since innovativeness requires investing heavily in R&D, it is resource-intensive. Thus, innovativeness entails a large expenditure of resources in the short-run (Li & Atuahene-Gima, 2001). This means that innovative behaviours are costly in the early stages of investment due to the up-front costs of R&D expenditure and would jeopardise the possibility of a firm meeting its short-term obligations (Kreiser et al., 2013). The initial period in R&D and innovative learning was described by Cheng and Van de Ven (1996) as a 'chaotic and complex' process, but the chaos is then reduced as the innovative learning process becomes more structured.

Based on the EO-as-Experimentation, innovativeness aligns with exploratory learning and involves the search to develop new products or technological processes (Wiklund & Shepherd, 2011). From insights into organisational learning theory, innovation is vital for enhancing a firm's existing competencies and acquiring new domains of activities (Zahra et al., 1999). Based on organisational learning theory, we hypothesised that innovativeness represents a behaviour that generates new knowledge flows into its existing knowledge bases and is a long-term investment in intangible assets (Dodgson, 1991, 1993). Innovativeness would improve the market value of the firm even though it is expensive to generate in the short-run (Lin et al., 2006). Thereby, this thesis posits based upon the EO-as-Experimentation, innovativeness develops new competencies that are crucial for building a competitive advantage, yet such a trial and error strategic orientation results in upfront high costs to develop such resource intensive behaviours (Cohen &

Levinthal, 1989; Wiklund & Shepherd, 2011). The EO-as-Experimentation perspective predicted a bright and a dark side to the dimensions of EO (Patel et al., 2015), in which this effect would be shown when the time factor is included. Thus, even though innovativeness is costly at its initial investment, such investment would materialise across time (Cheng & Van de Ven, 1996). We hypothesised based on organisational learning theory, that innovativeness has a negative impact on the failure rate of a business as high-technology firms must continuously innovate to renew themselves in a changing environmental context (Zahra, 1996; Zahra et al., 1999). The continuous generation of new knowledge flows through innovative learning is vital for developing and sustaining core competencies (Hamel & Prahalad, 1990).Over time innovativeness would ensure the ability of the firm to adapt to changes and remain viable (Danneels, 2002). Furthermore, according to organisational learning theory, when examining the effects of different levels of innovativeness, the benefits are likely to outweigh the costs at high levels of innovativeness (Fiol & Lyles, 1985). Thus, this thesis hypothesised based on organisational learning theory and the EO-as-Experimentation perspective that:

H6a: Innovativeness has a negative effect on short-term firm performance (ROA).
H6b: Innovativeness has a positive effect on long-term firm performance (Tobin's Q).
H6c: Innovativeness has a negative effect on firm failure.

3.7.2 Proactiveness

Proactive learning, according to organisational learning theory, involves firms taking the initiative to change their current way of operating and challenging the status quo instead of adapting or reacting to current environmental changes (Perez Lopez et al., 2005; Sinkula, 1994). Thus, proactive firms favour generative learning (Garcia-Morales & Llorens-Montes, 2006) and are actively affecting and aiming to control the external environment in which they learn (Dodgson, 1993). Proactiveness represents an opportunity-seeking component of EO and seeks to anticipate future demand to instil changes in its current strategies in response to the market needs (Lumpkin & Dess, 1996; Venkatraman, 1989). By anticipating the changes in the marketplace, proactive firms can adjust in accordance to its customer needs and increase its receptiveness to the latent market signals (Crant, 2000;

Hughes & Morgan, 2007; Morgan & Berthon, 2008). Through being more responsive rather than being reactive to the future trends in the market, firms can introduce new products and improve their strategies to seize new opportunities in the market and seize more market share ahead of the competition (Hamel & Prahalad, 1991; Lumpkin & Dess, 2001). Thereby, proactiveness has been viewed in the literature as a competitive advantage yielding firm-level behaviour; it has been shown that it is beneficial on short-term measures of firm performance (sales growth and profitability measures) (Hughes & Morgan, 2007 Wright et al., 1995). In this sense, a growing body of literature reveals that proactiveness leads to positive outcomes, yet they have not tested the effect of proactive learning on long-term outcomes and over time.

March (2006) explains that firms use “technologies of rationality” or “rational-based model logic” to determine whether they engage in explorative or exploitative learning. This model-based assessment involves rational techniques (abstractions, data and decision rules) to assess alternative strategies as a response to external environmental opportunities. Firms engage in proactive learning as a result of expected values and probability of possible future outcomes (Barnett & Burgelman, 1996). That is, firms engage in proactive learning to exert their control over their environment in a way that allows gaining of new resources to prepare them for future challenges (Strauss & Parker, 2018). The process for proactive learning differs from the process of innovative learning. Using insights from prospect theory and cybernetic control perspective, firms engage in proactive behaviours or learning by comparing their current situation to a reference value in order to control the possible future outcomes (Carver & Scheier, 1998; Kahneman & Tversky, 1979, 2000; Tversky & Kahneman, 1991).

Proactive learning or behaviours are intended to reduce the discrepancy between the current performance level of the firm to a reference value or desired state of achieving higher performance returns (Barnett & Burgelman, 1996; Fiegenbaum & Thomas,1988). Yet, the process through which firms engage in the process of proactive learning by using technologies of rationality can lead to disastrous outcomes as firms can possibly mis-specify situations and as such rational technologies may not produce the desirable outcomes that they were intended to (Albin & Foley, 1998).

Although proactiveness generally involves reducing the discrepancy between the current situation and future desired reference value, there are different outcomes from proactive behaviours depending on achieving either an ideal reference value in the present or an expected future reference value (Boldero & Francis, 2000; Crant, 2000). Thus, proactive behaviours are considered to be exploratory learning behaviours that focus on management of resources to be either utilised to achieve a desired state in the present or to accumulate/commit further resources in order to achieve a future reference value in anticipation of uncertain market opportunities (Slater & Narver, 1995). As Hughes and Morgan (2007, p. 653) stated the aim or proactiveness is twofold: "to secure first-mover advantage in the *short term* and shape the direction of the market environment in the *long term*. A proactive behaviour in the short-run that aims to decrease the discrepancy between the current state and a reference value that is present focused and salient with 'already-known threats' would be less risky in comparison to future-accumulation oriented proactive behaviour, which relies on uncertain predictions of future markets (Boldero & Francis, 2000; March, 1991; Strauss & Parker, 2018). As stated by Pennington and Roese (2003, p. 572) "temporal distance affords greater opportunity for taking risks". In this sense, prospect theory predicts that proactiveness would enhance short-term profitability but would negatively impact a firm's long-term performance and increase the risk of failure over time.

According to organisational learning theory, proactiveness does not merely entail anticipating future demand, but also acting upon that forecasted changes in the market (Bateman & Crant, 1993). Based on the EO-as-Experimentation, since proactiveness is characterised by taking long-term gambles to predict future market needs, this might not materialise into successful outcomes as futuristic market trends cannot be predicted accurately based on the current market needs (Barnett & Burgelman, 1996; Patel et al., 2015). Firms in the high-technology context are forced to continuously and aggressively innovate and invest in external opportunities to stay ahead of competitors (Rauch et al., 2009). By re-investing in the business for investing in future markets, the firm might miss the investment opportunities in the current market (Atuanhene-Gima et al., 2005).There is a trade-off between the ability to leverage internal resources and the misallocation of resources as a result of being proactive (Barnett & Burgelman, 1996)). Furthermore, recent evidence has shown that firms that talk less about the future in their annual reports offer higher returns for their stock portfolio (Karapandza, 2016). Proactiveness would not fuel future growth in earnings and is associated with 'inefficient empire building' (Scharfstein & Stein, 2000). This is because it is associated with focusing on unknown information about the predicted state of the future market (Levinthal & March, 1993). Drawing insights from agency theory, proactiveness might fuel managerial expansion in the business rather than benefit shareholders as retaining earnings is more of an attractive incentive for managers than issuing stocks or paying dividends (Jensen, 1986).

In accordance to organisational learning theory, proactiveness is an exploratory learning behaviour and is involved in attending to latent market needs by seeking future opportunities (Dodgson, 1993;March, 1991; Sinkula, 1994). Furthermore, proactiveness requires a firm to take futuristic gambles on its internal resources that may lead to negative outcomes in the long-run (Barnett & Burgelman, 1996). Proactiveness involves predicting future market needs by observing the current market and conducting market experiments.

In summary, according to prospect theory, proactive learning that aims to decrease the discrepancy between a desired state in the present and the current situation would be less risky and generate certain profits in the short-run (Boldero & Francis, 2000). Furthermore, concerning the impact of proactiveness on long-term performance and risk of failure, according to organisational learning theory and prospect theory, proactiveness carries risks of negatively affecting a firm's long-term performance as well as its survival because the firm focuses on unknown and forecasted information and this might hinder the development of its existing 'core competencies' (Kahneman & Tversky, 1979, 2000; Levinthal & March, 1993; March, 1991;). Proactiveness is predicted to have a double-edged nature based on the EO-as-Experimentation perspective and as such the 'dark side' of proactiveness would not be shown unless tested across time (Wiklund & Shepherd, 2011). Furthermore, drawing insights from organisational learning theory, the negative outcomes of proactiveness are likely to be maximised at higher levels of proactiveness (March, 1991). Thereby, based on the organisational learning theory and prospect theory, it is hypothesised that:

H7a: Proactiveness has a positive effect on short-term firm performance (ROA).

H7b: Proactiveness has a negative effect on long-term firm performance (Tobin's Q).
H7c: Proactiveness has a positive effect on firm failure.

3.7.3 Risk Taking

Risk-taking behaviours are opportunity seeking, explorative in nature, and involve the process of making extreme changes in current strategies and a re-orientation in the expectation of achieving higher profits (Baird & Thomas, 1990; Hambrick & D'Aveni, 1988; March, 1991). Risk taking requires from firms to make timely strategic decisions. In fast-paced high-velocity technology-oriented environments, risk taking behaviours coupled with fast strategic decision making helps firms to keep up the pace with the changes in the environment and has been linked to an improved firm performance (Eisenhardt, 1989). Thus, a degree of risk taking is required by firms in the high-technology context to avoid being passive or conservative to rapid changes in the market, adhering to current strategies, and being in a state of inertia (Eisenhardt, 1989).

Risk taking, a dimension of EO, is defined as taking bold moves (rather than incremental moves) and venturing into new markets that may lead to uncertain outcomes (Lumpkin & Dess, 1996; Miller, 1983). This risk is termed unsystematic or idiosyncratic risk; it is unattributed to the industry and is represented by the fluctuations in the share prices of firms (Fama, 1968). When firms engage in risky behaviours, they have an inherent tolerance for ambiguity and as such position themselves at a higher probability of failure (Begley & Boyd, 1987).

The relationship between risk and return has received great attention following the risk-return paradox by Bowman (1980) (Bromiley, 1991; Fiegenbaum & Thomas, 1988). Bowman (1980) termed the risk and return relationship as a paradox since conventional economic and finance theories and previous empirical studies considered that there is a positive association between risk and return (e.g. Fisher & Hall, 1969). Fiegenbaum and Thomas (1988) found a positive association between risk and returns for above-average performance firms and a negative association between risk and returns for firms with below-average performance. This finding corroborates the concept of Bowman's (1980) risk-return paradox, in which

Bowman (1980) identified a negative relationship between risk and average returns based on accounting measures of performance, and the predictions set within prospect theory (Kahneman & Tversky, 1979). Support for the predictions set within prospect theory for the risk-return relationship have been found to extend to non-US samples (Jegers, 1991; Sinha, 1994) and in updated 20-year samples (Chou et al., 2009). Thus, in this thesis we use insights from prospect theory to explain the risk and return paradox relationship (Nickel & Rodriguez, 2002).

Prospect theory considers that risk preferences or attitudes of firms are determined based on a target or reference point of value (Kahneman & Tversky, 1979). According to prospect theory, with increasing levels of risk within strategic decision making, the probability of successful outcomes decreases (Singh, 1986). The risk-return paradox predicts that high levels of risk taking are more likely to lead to negative accounting performance (return on equity) outcomes (Bowman, 1980). As such, we suggest according to prospect theory and the risk-return paradox, the risk-return relationship is non-linear (Fiegenbaum & Thomas, 1988). Past authors have suggested that the risk-return paradox can be explained from predictions set within prospect theory (Fiegenbaum & Thomas, 1988). Risk taking behaviours improve returns up to a threshold, after which there are decreasing returns to increasing levels of risk taking (Bromiley, 1991). Begley and Boyd (1987, p. 89), noted that "risk-taking has a positive effect on ROA up to a point. Beyond that point, increases in risk-taking begin to exert a negative effect on ROA." Risk taking behaviours lead to immediate financial returns. Yet, due to the risk-return paradox there are limits to the benefits of the risk taking dimension of learning.

Risk taking is the dimension of organisational learning that is interlinked with the myopia and the hazards associated with explorative learning (Levinthal & March, 1993). Insights from behavioural theory of the firm and prospect theory can explain the outcomes predicted from risk taking (Argote & Greve, 2007; Miller & Leiblein; 1996). That is, similar to proactive learning, risk taking operates through the concept of aspiration or target levels of performance, in which organisational decision making is risk averse in the domain of gains (i.e. the performance is above the target reference level), whereas organisational decision making is risk seeking in the domain of losses (performance is below the reference level) (Fiegenbaum & Thomas, 1988; Lant et al., 1992; Singh, 1986).

Risk taking behaviours affect firm-level outcomes based on reducing the discrepancy between the current state and desired current wealth level or future aspired state (Fiegenbaum & Thomas, 1988). Risk taking behaviours allow firms to take advantage and to seize market opportunities by making decisions in a timely manner, which places risky firms at an edge over firms that ‘miss the window’ (Eisenhardt, 1989). Yet, unlike proactive behaviours, risk taking entails higher costs with increasing levels of risk in the short-run (Bowman, 1980). Furthermore, firms that perform poorly are susceptible to be more risk seeking in their investment strategies and decision making (Singh, 1986). Poorly performing firms take risks similar to taking gambles in that with more risk taking, there is a higher likelihood of future lower performance values. Thereby, increasingly taking risks in the long-run is likely to not pay-off for firms (Bromiley, 1991; March, 1991).

As Lumpkin and Dess (1996) stated, risk taking if excessive in certain contexts might be detrimental to a firm’s performance. Risk taking is likely to be counter-productive for some firms as it might affect the viability of such firms (Levinthal & March, 1993). Thus, risk taking carries high costs which outweigh its benefits in the short-run (Wiklund & Shepherd, 2005). Unlike innovativeness, risk taking has more of a focus on the short-term profitability (Lumpkin et al., 2010). In the literature, it has been shown that risk taking has an inverse U-shaped relationship with short-term firm performance. With increasing levels of risk, there is a greater likelihood that risk taking would decrease the firm’s short-term returns (Kreiser et al., 2013). When controlling for the effects of innovativeness and proactiveness, risk taking has been shown to negatively affect a firm’s performance (Hughes & Morgan, 2007).

Learning can negatively influence performance when firms must discard their known practices for new methods of operation which is risky (Levitt & March, 1988). Drawing theoretical insights from organisational learning theory, risk taking is associated with behaviours that are characterised with uncertainty and experimentation and can carry with it the costs of failure (Levinthal & March, 1993). Based on the EO-as-Experimentation perspective, a risky orientation requires firms to undertake behaviours that have ambiguous and uncertain returns, which would have a high probability in resulting in losses across time and hasten organisational death(Wiklund & Shepherd, 2011). Organisational decline triggers the learning process that emphasises risk taking; risk taking only accelerates the organisational decline over time (March, 1981; Singh, 1986; Staw et al., 1981).

The learning process of risk taking behaviours involves the use of decision heuristics and biases, which are simple strategies and decision rules that firms use when faced with an uncertain environment to assist with the decision-making process (Busentiz & Barney, 1997). Firms use decision heuristics as it requires the implementation of timely risky decisions under conditions of uncertainty (Eisenhardt, 1989). That is, the learning process of risk taking pressurises firms to make large commitments to resources before assessment of alternative actions to be taken (Covin & Slevin, 1991; Miller & Friesen, 1978).

In summary, based on prospect theory and organisational learning theory, a risky orientation is characterised by having contrasting effects, i.e. firms undertake risky behaviour to ensure financial returns, yet across time such a risky orientation leads to higher probability of loss rather than positive financial returns (Bromiley, 1991). The high costs to the risk taking dimension are revealed at higher levels of risk, which is explained by the risk-return paradox (Alvarez, 2007; Bowman, 1980)). Thus, this thesis hypothesised based on organisational learning theory and prospect theory that:

H8a: Risk taking has an inverse U-shaped effect on short-term firm performance (ROA).
H8b: Risk taking has a negative effect on long-term firm performance (Tobin's Q).
H8c: Risk taking has a positive effect on firm failure.

3.8 Chapter Conclusion

The purpose for outlining the EO-as-Experimentation perspective is to answer the ambiguity and guide the research questions and relevant hypotheses. After outlining the role of organisational learning theory and prospect theory to examine the role of EO on firm performance and failure, the section that follows explains the methods that were undertaken to examine the EO/EO dimensions and firm performance/risk of failure relationships. The above hypotheses *H*1 to *H*8 respond to the over-arching research aims of testing the effect of EO and its dimensions on firm performance and on risk of failure. Study 1 tested hypotheses *H*1, *H*2a and *H*2b, *H*3a and *H3*b, *H*6a, *H*6b, *H*7a, *H*7b, *H*8a, and *H*8b. Study 2 tested hypotheses *H*4, *H*5, *H*6c, *H*7c, and *H*8c.

Chapter 4

Research Philosophy and Design

4.1 Introduction to the Chapter

The purpose of the chapter is to describe the philosophical underpinnings of this research (ontology and epistemology). The researcher's underlying philosophical beliefs, which are grounded in organisational learning and prospect theory, have guided this research. The chapter aims to achieve a philosophical grounding and describe the variables included in the overall thesis. The beginning of the chapter consists of describing the research philosophy as well as the research design and the research methodology undertaken. The chapter also describes the sample chosen and the reasoning behind such selection.

The next section will outline the philosophical positioning of this research (i.e. ontology and epistemology).

4.2 Research Philosophical Position

The following section considers the ontology and epistemological assumptions underlying this thesis. The beginning of the section will introduce the importance of setting one's ontology and epistemology and then introduce the thesis's ontological followed by the epistemological positioning.

4.2.1 Introduction: Locating Ontology and Epistemology in Research Endeavours

This section outlines the researcher's beliefs and ontological and epistemological underpinnings of the research. The following section aims to set the stage for the philosophical design by reinforcing the link between the thesis theoretical grounding and its philosophical positioning.

Theory forms the building blocks to inform research since researchers need to have a theoretical foundation to guide their research to understand the social world (May, 2011). Thus, one should consider the link between the theoretical foundations of the research and the research philosophy and design as there is a mutual interdependence between research and theory in which concepts are shaped and made meaningful by theory (Bryman, 2015; Della Porta & Keating, 2008). There are two types of theories: grand and middle range theories (Merton, 1976). Grand theories are abstract in nature, which makes them of limited usability in social research (Bryman, 2015). Middle range theories, on the other hand, aim to explain a limited scope within social life, which makes them common among social researchers (Pinder & Moore, 2012). To guide the research questions and research endeavour, the EO-as-Experimentation perspective, which is derived from organisational learning theory and prospect theory, was used. In this research, the middle range theory described above is concerned with looking at the macro-level organisational behaviour.

There are two approaches to research, either an inductive or a deductive strategy. The choice of hypothetico-deductive strategy, which is in line with a quantitative inquiry, falls naturally from a positivist approach (Bryman, 2015; Della Porta & Keating, 2008; Sarantakos, 2012). The alternative approach is inductive strategy, which is often associated with qualitative data collection methods whereby the interpretivist or constructionist researcher aims to construct theory from observations and data findings (Bryman, 2015; Sarantakos, 2012). Thus, researchers who adopt the inductive approach modify their research design as they progress throughout their research. Whereas, those who adopt the deductive approach clearly define and operationalise the investigated constructs and develop the hypotheses to be tested (Della Porta & Keating, 2008). After systematically identifying the theories in this research, the next step was to generate hypotheses, which would be empirically tested. This is consistent with theory-guided deductive line of reasoning (Blaikie, 2009; May, 2011).

Following questions on ‘what to research?’ and ‘how to research?’, the ‘why to research?’ is as important and entails the underlying theoretical grounding (Remenyi et al., 1998). The ‘what to study’ is the ontological question, concerning the social phenomenon under investigation, in which it sets the stage for the research. The conceptualisation of the theoretical constructs is important before addressing the other questions (Della Porta & Keating, 2008). The ‘how to obtain knowledge’ is the epistemological question and is associated with the choice of the methodology. Lastly the ‘why to study’ is concerned with the hypotheses of the research (Della Porta & Keating, 2008). The philosophical paradigm is the building blocks of the research rather than the methodology itself (Holden & Lynch, 2004). The philosophical paradigm gives rise to the methodological choice (Bryman, 2015).

When selecting a research methodology, one must first consider the philosophical paradigm behind the research's methodology; that is the ontological and epistemological stance (Bryman, 2015; Grix, 2002; Leitch et al., 2009). Thus, this thesis is research-led by the research questions rather than method-led (Grix, 2002). Thus, the philosophical positioning of the research must guide the choice of the methodology (Grix, 2002; Leitch et al., 2009).

Social scientists tend to examine abstract concepts that are representations of the social world (Della Porta & Keating, 2008). Thus, for social scientists it is vital to have clarity on the epistemological and ontological assumptions about the social entities under investigation. The researcher's ontological stance, the starting point of any research, affects their epistemological stance, which in turn affects their methodological choice, and their research methods and choice of sources of data (Easterby-Smith et al., 2012; Grix, 2002; Holden & Lynch, 2004). Thereby, the core components of research to consider include the ontological and epistemological underpinnings as well as the methodology (Grix, 2002). These three components are defined as the research paradigm, which guides the research endeavour (Guba & Lincoln, 1994; Morgan, 2007; Punch, 2013).

Ontology refers to the theory of reality or of social entities (Blanche et al., 2006; Bryman, 2015; Punch, 2013). In social research, ontological underpinnings aim to answer questions on 'what is the nature of social reality that is to be investigated?' (Hay, 2002, p. 63). Thus, ontology is concerned with the beliefs and assumptions that are made about the nature of social entities (Blaikie, 2007). The researcher's ontological assumption of reality dictates all other assumptions she/he makes; whereas the second assumption the researcher makes is the epistemological stance (Holden & Lynch, 2004).

Epistemology aims to answer questions on 'what and how can we know about a construct?' (Grix, 2002, p. 175). Thereby, epistemology is concerned with the relationship between the researcher and what can be known as knowledge (Blanche et al., 2006; Bryman, 2015; Punch, 2013). Thereby, epistemology is considered as the nature of knowledge and its possibility, limitations, and sources (Hamlyn, 1995) and ultimately refers to the theory of all knowledge.

The methodology, a researcher's approach, would be used to gain knowledge following the researcher's ontological and epistemological position (Holden & Lynch, 2004). Research methodology and research methods are related, yet not the same concepts. The methodology is the logic of scientific inquiry whereas the research methods refer to the tools and techniques used to acquire the data and analyse it. Thus, the methodology aims to answer the question on 'how to acquire knowledge?' whereas the research methods aim to answer the question on 'what are the procedures and techniques of analysis required to acquire that knowledge?' (Hay, 2002, p. 64). Following the research methodology and research methods, the researcher then makes the choice of which sources of the data are needed to represent the underlying constructs (Grix, 2002).

The next section will outline the ontological positioning of this research and outlines the various ontological beliefs in social research.

4.2.2 Ontological Position

Main ontological research approaches are divided into subjectivism and objectivism (Bryman, 2015; Remenyi et al., 1998; Sarantakos, 2012).

The objectivist approach exists on one end of the continuum (Morgan & Smircich, 1980). The objectivist approach was born as a result of social researchers employing the methods of natural sciences to examine a social phenomenon (Bryman, 2015; Grix, 2002; Holden & Lynch, 2004). Thus, the objectivist approach to social science indicates that social sciences should adapt the principles from the natural sciences, a view endorsed by Durkheim and Comte, since social phenomenon is under social and behavioural laws just as physical phenomenon is under physical laws (Bailey, 2008; Della Porta & Keating, 2008). The objectivist's ontological stance considers that reality is concrete and that the social world predates human existence. Thus, the world will still exist independent of human cognitive processes whether human beings perceive an external reality or not (Gill & Johnson, 1997; Holden & Lynch, 2004). Accordingly, the social phenomena are objective and have an autonomous existence or reality that is independent of human interpretation (Corbetta, 2003) and the task of the researcher is to analyse this reality (Bryman, 2015; Della Porta & Keating, 2008).

On the other end, lies the subjectivist ontological perspective. It considers that there is no such thing as concrete reality because it is a product of the social scientist's imagination (Della Porta & Keating, 2008; Holden & Lynch, 2004; Sarantakos, 2012). That is, social phenomenon can only be derived from social actors (Bryman, 2015). Thus, reality does not exist outside the realms of one's own mind (Morgan & Smircich, 1980). Not only do social actors construct reality, but they continuously construct and reconstruct such reality (Bryman, 2015; Sarantakos, 2012).

In this research, the ontological belief is that social behaviour can be explained and tested empirically through the premise that its causes and effects can be approximately measured and made identifiable (Della Porta & Keating, 2008). Thus, objectivism is the ontological stance adopted in this research. The advantage of the objectivist approach is that it is able to test hypotheses using large samples (Bryman, 2015; Holden & Lynch, 2004; May, 2011). It is the researcher's belief that valid knowledge about the constructs can only be achieved through appropriate measurement that is independent of the social actors that inhabit the organisation. As such, the concern in this research is in the property or exhibition of a firm-level behaviour EO, in which the units of analysis are the firms in the sample.

The constructs under investigation are objectively measured at the organisational macro-level, devoid of managerial interference, in the form of variables. Thus, this thesis is a variable-based research whose interest is in generating parsimonious explanations to reach an 'unadorned' form of truth (Della Porta & Keating, 2008). Objectivists are usually more concerned with the language of variables than cases, and they are interested in the properties of cases rather than the cases themselves. Thereby, in variable-based research the cases are made anonymous and transformed into variables (Della Porta & Keating, 2008). Social scientists that employ a variable-based research ensure that most variables are included to account for all the possible variations. With the increase in the number of variables, it is of precedence to ensure that there are many observations included to conduct statistical analysis (Della Porta & Keating, 2008).

Subjectivists argue that researchers cannot distant themselves fully from the observations made as meanings do not exist beyond the realms of the human mind (Sarantakos, 2012). Thus, subjectivists focus on the meaning attained behind the relationships of the constructs rather than the measurement of those constructs (Holden & Lynch, 2004). Critics of the objectivist approach consider that complex phenomena of social nature cannot be examined using natural science measurements and that applying a subjectivist approach is more appropriate in the social sciences (Guba & Linclon, 1994; Holden & Lynch, 2004). However, subjectivism is not flawless since it has its shortcomings, being characterised by the lack of replicability/reliability and lack of absolutism (Holden & Lynch, 2004). By adopting an objectivist approach, the researcher can separate from the investigated construct(s) and avoid the possibility of contaminating the data by his/her subjective views (Della Porta & Keating, 2008).

Admittedly, even statistical evidence generated through data collected by way of appropriate objective measures is still open to a degree of interpretation (Bailey, 2008). The difference with respect to subjectivism, however, is that the researcher accepts only the measurement of constructs that can be clearly defined and measured as reality, i.e. without the biases of managers that lead to inaccurate measurements of the constructs. Subjective bias and the risk of error therein are minimised in objectivist approaches to research (Bailey, 2008; Creswell, 2013; Sarantakos, 2012).

The next section will consider the epistemological positioning of this research.

4.2.3 Epistemological Position

The main paradigms representing alternative epistemological positions are positivism on the one end and constructionism/interpretivism on the other end (Bernard, 2012; Easterby-Smith et al., 2012; Grix, 2002; Remneyi et al., 1998).

The positivist stance states that valid knowledge can only be obtained through observation and measurement (Leitch et al., 2009; Morgan & Smircich, 1980). Positivism is a natural science epistemology, which advocates the use of natural 'hard' science methods in the examination of reality in the social sciences (Blaikie, 2007; Bryman, 2015; Della Porta & Keating, 2008). The main principle of positivism is that only constructs that are confirmed by the senses and are observable can be considered as genuine (Bryman, 2015). Thus, the researcher can objectively analyse the object under investigation, in a neutral manner, separate from the mind of the researcher (Della Porta & Keating, 2008).

According to positivism, social science can be conducted in a way that is value free and objective (Holden & Lynch, 2004; Leitch et al., 2009; Punch, 2013). However, many social scientists have refrained from taking a full positivist epistemological stance as it does have its limitations. Some social scientists have termed it superficial or reductionist, since human behaviour and social constructs are too complex to be reduced into naturalistic representations (Bhaskar, 2013; Blaikie, 2007; Holden & Lynch, 2004).

On the other hand, interpretivism or constructionism considers that knowledge is relative and can only be subjectively attained (Punch, 2013). Interpretivism is an epistemological position, which considers that a social scientist must take into account the meanings that social actors bring along to situations (Bryman, 2015; Punch, 2013). Constructionism considers that social phenomenon is accomplished and continually constructed by its social actors (Guba & Lincoln, 1994; Punch, 2013). Thus, they both share the view that social constructs cannot be subjected to the methods of natural sciences (Sarantakos, 2012). The origin to such epistemological positions, which are naturally anti-positivist in nature, is phenomenology (Bryman, 2015). Phenomenology is concerned with how social actors make sense of the world, which considers that social reality is meaningful to its social actors. Thus, subjectivists investigate social reality from their point of view, such that humanistic interpretation is the core of all knowledge (Bryman, 2015; Della Porta & Keating, 2008; Sarantakos, 2012). In comparison to positivists, interpretivists/constructionists consider that social science is an interpretative science which searches for meaning, rather than a natural or experimental science (Della Porta & Keating, 2008).

Based on the research questions and the researcher's belief about the nature of reality as being objective, I lean towards a positivist epistemological position (Holden & Lynch, 2004; Leitch et al., 2009; Punch, 2013). The philosophical position guides the methodology as being quantitative in nature and entails the use of objective measures to resemble the underlying constructs, which are firm-level entrepreneurial orientation and organisational outcomes (Blanche et al., 2006;

Easterby-Smith et al., 2012; Punch, 2013). According to positivists or 'experimentalists', social science should lend itself to examining social constructs or behaviours that are measurable in terms of variables and aim to deconstruct complex phenomenon to their independent components and examine them separately. Thus, this research aims to deconstruct the EO complex construct to its dimensions by objectively capturing them (Della Porta & Keating, 2008).

Management research should originate from the researcher's beliefs of the social phenomenon under examination and of social reality (Keat & Urry, 2011). Thus, there should be more of a focus on the philosophical underpinnings of the research in the management literature rather than just the choice of the methodology (Easterby-Smith et al., 2012; Leitch et al., 2009). Thus, adopting methodologies, which are successful in natural sciences does not make them particularly successful in management and entrepreneurship literatures (Lawson, 2008).

Social scientists cannot be fully positivist in nature due to the complexity of social constructs that have underlying mechanisms that cannot be observed by the naked eye (Dogan, 2013; Keat & Urry, 2011). Thus, an acceptance of the limitations of a positivist approach is needed. To this end, post-positivist scientific realism was born to counter the criticisms against positivism (Dogan, 2013). Unlike positivism, scientific realism accounts for the possibility of having unobservable constructs that exist within the realms of science and that can be expressed in theoretical terms (metaphysical phenomenon) (Bhaskar, 2013; Greenough & Lynch, 2006). In that retrospect, such underlying complex constructs, which cannot be observed, can be quantified in terms of their effects (Bhaskar, 2013; Dogan, 2013). Thereby, scientific realism is considered as a branch of the ontological positioning of objectivism (Stockman, 2013).

Due to the limitations of a full positivist position, this research adopts the view of scientific realism, which is considered a logical positivist position (Dogan, 2013). This is consistent with this research considering that entrepreneurial orientation and its dimensions as well as firm-level outcomes are complex constructs, which might not be observable but could be quantified for examining their effects (Bhaskar, 2013; Greenough & Lynch, 2006). Furthermore, unlike positivism, which starts with observation or experimentation, scientific realism considers that theory is a prerequisite to research (Bhaskar, 2013). Thus, this research adopts scientific realism since it falls in line with the deductive approach to research. This approach entails the examination of the complex constructs that was preceded by the theoretical underpinnings (Bhaskar, 2013; Dogan, 2013). Unlike positivists, scientific realists acknowledge that there is a difference between the reality that they are observing and their depiction of it (Bhaskar, 2013; Bryman, 2015; May, 2011).

Scientific realism, however, shares some features with positivism (Bailey, 2008; Bhaskar, 2013). Scientific realism uses the same methods as natural sciences to social sciences; however, unlike positivism or 'naïve realism', it considers that absolute knowledge cannot be reached through humanistic perceptions of reality (Bhaskar, 2013; Hunt, 2005). This is a view that was initially endorsed by Weber, who considered that scientific realism is not a strictly positivist approach (Bailey, 2008). Thus, scientific realism accepts that social reality does not have to be directly observable but inferable through indirect measurements (Easterby-Smith et al., 2012).

The next section will discuss the research methodology and research design undertaken in the overall thesis.

4.3 Research Design and Methodology

This section will outline the research design types with a focus on the research design of this thesis, followed by the research methodology and the time dimension.

4.3.1 Research Design

Social science research involves either theory testing, which is in line with deductive reasoning, or theory generation, which involves inductive reasoning (Popper, 2002). Research designs are classified according to the researcher's purpose in the expectation that they would reduce uncertainty about the underlying constructs (Zikmund et al., 2013).

Research designs are categorised into exploratory or confirmatory designs (Blaikie, 2009; Zikmund et al., 2013). Confirmatory research designs can be considered either descriptive or experimental (i.e. explanatory or causal) (Zikmund et al., 2013). Thereby, a researcher chooses between three possible research designs: exploratory, descriptive, or experimental designs.

Exploratory research is considered the starting point of theory building (Zikmund et al., 2013). Confirmatory research is considered applicable when the researcher detects or formulates a gap or a problem in the literature and with the guidance of an existing theory sets to answer the research questions in support of the theories in the literature (the intent being to support, extend, challenge or debunk existing theory) (Zikmund et al., 2013).

The start of any research is through exploratory research with the expectation that it will set the stage for descriptive research, which would then establish the appropriateness of causal/experimental research (Bryman, 2015; Zikmund et al, 2013).

The purpose of a researcher conducting exploratory research designs tends to involve clarifying an ambiguous situation, however, it does not provide conclusive results (Zikmund et al., 2013). Exploratory research tends to be highly unstructured and usually conducted in the early stages of research when there is high uncertainty about the construct(s).

Exploratory research involves a preliminary inquiry about a phenomenon that has not been explored in the literature, so it follows a flexible and an open ended inductive approach (Blaikie, 2009; Blanche et al., 2006).

Descriptive research tends to be conducted in later stages when the researcher is aware of the problem, but needs to probe around one or more research questions to attain more knowledge regarding the constructs and develop a better understanding of the relationships between the variables (Zikmund et al., 2013). Thus, descriptive research aims to describe a phenomenon accurately that follows from a more rigorous approach whereby the researcher has a clear set of research questions to guide the research (Blaikie, 2009; Blanche et al., 2006). Descriptive research tends to entail a focus on the representativeness of the sample, and validity and reliability of the measured relationships (Blanche et al., 2006).
Lastly, experimental research designs, which tend to be used to test causal

relationships, are appropriate when the problem is clearly defined, and the researcher knows or predicts the causes and effects of the relationships under examination (Blanche et al., 2006; De Vaus, 2001; Zikmund et al., 2013).

Each research design attains different results, but also serves different purposes. Exploratory research, a discovery oriented form of research, can be considered as the most productive since it yields many ideas to generate a new theory. However, it is speculative in nature since such ideas need to be tested and put into a structure (Stebbins, 2001; Zikmund et al., 2013). Descriptive research designs describe relationships between variables. Thus, descriptive research produces confirmatory structured results. Descriptive studies explain what relationships look like, but do not explain why such relationships exist. Yet, having a clear description of the underlying relationships paves the way for investigating the explanation of such relationships (Punch, 2013). Causal research, can be considered as the most structured or tightly controlled research design, which explains why the investigated relationships exist and allows the production of confirmatory conclusive results. However, it is limited in usability because researchers must be able to tightly manage *all* variables in a controlled environment (Blanche et al., 2006; Zikmund et al., 2013).

The choice of which research design to adopt depends on the goals of the researcher and the researcher's purpose, research questions, and the philosophical position (Blanche et al., 2006; Zikmund et al., 2013). According to Newman and authors (2003) the researcher's purpose is more significant than the research questions as it is at a fundamental level which guides the research questions.

The purpose of this research is to add to the knowledge base on the entrepreneurial orientation construct by measuring the effect of EO and each of its dimensions on firm-level outcomes, using organisational learning theory and prospect theory. This is consistent with the descriptive design (starting with a theoretical framework and developing hypotheses to support or debunk that theory).

A descriptive design is selected in this thesis because the research purpose is centered on describing the relationships between firm-level EO and its dimensions and firm performance/failure. The research questions are centered on investigating the effects of each of EO and its dimensions on firm performance/failure. It is rare in the social sciences to conduct experimental research designs, which are mostly utilised in the natural sciences. Thereby, large-N (number of cases/observations) samples and statistical tools are used to approximate the experimental design and to infer cause-effect relationships rigorously (Della Porta & Keating, 2008). Such forms of studies that cover many observations are considered to provide significant and valid inferences. Brady et al. (2004) consider that a mainstream tool that is used by social scientists is regression analysis, which is used to infer causal relationships. By using regression multivariate analysis, causal modelling is achieved through examining the effects of several variables (main and control variables) on the dependent variables as well as approximating the 'concomitant variations' between the predictor and dependent variables in the form of regression coefficients (Della Porta & Keating, 2008).

The next section will outline an overview of various research methodologies and the methodology adopted in this thesis.

4.3.2 Research Methodology

Quantitative methodologies have been mostly identified with the deductive strategy whereas qualitative methodologies in exploratory designs have been identified with the inductive strategy (Bernard, 2012; Blanche et al., 2006).

Qualitative investigations focus on examining constructs in depth and provide a lot of rich data and nuanced details that quantitative methods cannot provide (Blanche et al., 2006; Taylor, 2005; Zikmund et al., 2013). Thus, a qualitative methodology is appropriate for exploratory research designs, which are utilised by interpretivists and constructionists, and can be suitable for descriptive research designs when the intent is to show in detail how a phenomenon appears to operate with the purpose of building theory (Blanche et al., 2006). However, qualitative research can be limited in its ability to test research questions and hypotheses due to its lack of intersubjective explicability (i.e. different researchers using the same tools to come to same conclusions) and researcher dependency (Zikmund et al., 2013).

Quantitative investigations are more objective than qualitative methods since they involve numerical data and empirical analysis, in which the researcher is detached from the data generation and analysis process (Blanche et al., 2006; Taylor, 2005; Zikmund et al., 2013). Quantitative investigations, mostly utilised by positivist researchers, are appropriate when the research design is either descriptive or experimental. Quantitative methods mostly involve a set of testable hypotheses whereby the intent is to test theory and quantify underlying relationships between regressed variable(s) and a dependent variable with the inference of a causal sequencing effect (Blanche et al., 2006; Creswell, 2013; Della Porta & Keating, 2008).

The notion that quantitative methods are concerned only with theory testing and qualitative methods with theory generation is an oversimplification (Bryman & Bell, 2015). In fact, quantitative methodologies are concerned with generating theories just as qualitative methodologies are associated with testing theories or hypotheses (Bryman & Bell, 2015; Punch, 2013). For instance, the analysis of quantitative data based on social surveys is more exploratory in nature and can generate theories (Bryman & Bell, 2015).

Following the ontological underpinnings of this research (i.e. objectivism), and the epistemological position (i.e. scientific realism), the research design chosen was descriptive in nature. The intent of this research was to test theories, organisational learning theory and prospect theory, using testable hypotheses explaining the EO-firm performance/failure relationship. Thereby, the research methodology of this thesis is a quantitative method (whilst allowing room for interpretation) (Bryman, 2015; Dogan, 2013).

The next section will introduce the time dimension in this thesis.

4.3.3 Time Dimension

The time dimension is an important characteristic of any research to consider, in which the choice of the time dimension depends on the research purpose and questions (Blaikie, 2009). There are several types of research, which differ on the time dimension: either cross-sectional (at one point in time), historical (in the past), or longitudinal (extended at several points in time). Longitudinal research refers to the emphasis of the aspect of change (Ployhart & Vandenburg, 2010). There are different types of longitudinal research studies. Such types are classified as either time series (conducted at different points in time), panel (examining the same firms or people over time combining time series and cross-sectional forms of data), or cohort (examining the same categories of people or organisations, who share similar characteristics and experience a common type of event, over time) (Blaikie, 2009).

Longitudinal studies allow for the explanation and understanding of the relationships between variables and their interactions (Blaikie, 2009). It is surprising that most of the research in the social sciences, which involves theory testing, is conducted using cross-sectional designs that examine variables at only one point in time (Ployhart & Vandenburg, 2010). However, variables in cross-sectional studies are static such that cross-sectional designs cannot indicate how a variable varies over time (Maxwell & Cole, 2007). The adoption of a longitudinal design is more advantageous, since it allows the researcher to test how the relationship between the constructs of interest changes and shows how the strength of that relationship varies over time (Blaikie, 2009; Bryman, 2015). The strength of causal inference can be increased when a descriptive research design is made longitudinal (multiple time periods) over and above cross-sectional designs (single period) (Blaikie, 2009). Longitudinal studies would allow the researcher to evaluate and track the changes in relationships of the same entities over time (Blaikie, 2009). By utilising a longitudinal design then a causal relationship can be empirically tested and shown instead of mistakenly considering an association or correlation for spurious causation in a cross-sectional dataset (Della Porta & Keating, 2008).

This doctoral research is theory-driven and most theories in organisational sciences are developed to explain phenomenon that occur consistently at more than one point in time (Ployhart & Vandenburg, 2010). A longitudinal form is favoured in this thesis so that the long-term effects of EO and its dimensions on firm-level outcomes over time can be considered, whether effects are delayed or ‘lagged’ in nature, and what effects arise for firm performance and when, and how these might change over time and across various time periods (Blaikie, 2009). By adopting a longitudinal design, we were able to overcome the limitations of cross-sectional studies dominating the body of knowledge on EO (Ployhart & Vandenberg, 2010; Rauch et al., 2009).

In this thesis a longitudinal panel, from the pre-crisis (fiscal year 2000) until the post-crisis period (fiscal year 2014), was used to investigate the long-term effects of EO and its dimensions on the long-term firm value and firm failure/survival. One prominent type of a longitudinal study is a panel, which examines the same entities of interest over a significant period (Blaikie, 2009). Thus, panel data, which involves examining multiple variables across multiple time periods, will account for firm heterogeneity. Panel data using secondary data sources also avoids common method bias, which is characteristic of survey studies, since it allows the collection of data from different sources (Rauch et al., 2009).

4.4 Concluding Comments for Philosophical Position and Methodology

The purpose of this section was to re-emphasise and reiterate the researcher's ontological and epistemological positioning and the research method undertaken. For the purposes of this research, a quantitative investigation was adopted so that causal inferences are validly made to best understand the relationships among EO and its dimensions and firm performance/failure. The inferences that were drawn from this research; however, are dependent on the research sample and the period included (Della Porta & Keating, 2008).

A quantitative approach usually follows a deductive approach starting with theory and developing hypotheses to test theory. Furthermore, a deductive approach, is emphasised in research leaning towards positivism (Bailey, 2008; Blanche et al., 2006). In positivist research, cause-effect relationships between variables could be empirically tested (Della Porta & Keating, 2008). Following this research's deductive approach to theory testing and the objectivist ontological position and epistemological position based on scientific realism, the research methodology selected for this doctoral research endeavour is quantitative and secondary data was prioritised to obtain objective data on EO and firm performance measures. This research is in the form of a longitudinal large-scale panel, since the use of archival data enables researchers to use large sample over several periods of time. The use of secondary data avoids the costs of longitudinal studies, and allows for a more rigorous test of hypotheses in comparison to cross-sectional studies (Blaikie, 2009; Bryman, 2015). Furthermore, the use of objective data avoids problems of social desirability bias associated with primary data collection methods, which contaminate the data analysis (Haynes et al., 2014).

The next section will outline the research sample selection criteria.

4.5 Research Site and Sample

The purpose of this section, which applies to Study 1 and Study 2, is to provide reasoning behind the inclusion of the sample chosen as well as the sample size in relation to the main constructs under examination.

The research sample consisted of a sufficient number of firms pursuing an entrepreneurial orientation and operating in the high-technology industry. The choice of this industry is in accordance with the EO-as-Experimentation perspective and thus would provide insights on the effect of EO on firm-level outcomes (Wiklund & Shepherd, 2011). Most importantly, the choice of the industry is reasoned for and evidenced through the mean values of EO in the technology-oriented industry versus the excluded sample of firms, which will be shown below in section 4.6.

Technology-based firms operating in the high-technology industry were chosen for this research, since entrepreneurial orientation involves experimenting with new technologies (Wiklund & Shepherd, 2011). When examining the long-term effect of EO it is relevant to utilise the context of technology-oriented firms. Essentially firms belonging to the high-technology industry, which is constantly a changing growth oriented industry, are forced from the competitive pressures of such an industry into adopting an entrepreneurial orientation (Patel et al., 2015). Firms that face high technological changes are more likely to be more entrepreneurially oriented by exploring new technologies (Uotila et al., 2009). This is in line with the definition put forth by Lumpkin and Dess (1996). Thus, perhaps firms in the high-technology industry face a higher need for adopting EO (Rauch et al., 2009). Previous researchers examining EO have focused on the technology industry (e.g. Engelen et al., 2015; Hughes & Morgan, 2007; Patel et al., 2015). However, none have put forward the Wiklund and Shepherd's (2011) call for examining the effect of EO or its dimensions on firm failure, using insights from the EO-as-Experimentation perspective. This is where the contribution of this research comes in.

The widely accepted Fama and French (1997) industrial classifications were used to classify the firms into their respective industrial categories. The firms were classified into 12 industrial groups since the Fama and French (1997) 12 industrial classifications allows for a wider array of firms within each industry, rather than the finer 48 industrial classification of Fama and French, and would still give reliable results of industry effects (Fama & French, 1997). The 12 industrial classifications were extracted from the Fama and French website (Fama & French, 1997).

Financial industries (SIC codes 6000 to 6999) were excluded because they might hold cash to satisfy capital requirements (Bates et al., 2009), and may have faced dramatic change in regulation over the past 10 years particularly over the period of the financial crisis (Knights & McCabe, 2015). Furthermore, Fama and French (1992) have indicated that a financial firm's high leverage is not comparable to that of a non-financial firm, in which a non-financial firm's high leverage can indicate financial distress. Utilities firms (SIC codes 4900 to 4949) were also excluded, because they are subject to government regulation and are under state ownership, which is irrelevant to this research (Hoberg & Parabhala, 2009). This means that the utilities and financial firms are not comparable to firms from other industries, hence they were excluded (Baker & Wurgler, 2004; Hoberg &Parabhala, 2009).

The overall industrial classification of Fama and French (1997) were further refined to include only certain industrial codes to analyse the EO and firm performance relationship in a sample of high-technology-based firms. The classification of the high-technology industry was based on four-digit SIC (industrial classification codes) from Loughran and Ritter (2004). Thus, firms were coded as belonging to the high-technology industry as a dummy variable equal to one. The reason for choosing the four-digit classification of Loughran and Ritter (2004) is that at the three-digit SIC classification, some firms that are non-technology oriented might be included in the technology classification. For instance, the three-digit SIC=357 classification (i.e. computer hardware) contains office machines (SIC=3579). However, office machines, under the three-digit classification of computer hardware, are not considered technology-oriented firms (Oakey et al., 2010). By using the three-digit SIC classification, the boundaries of technology classification of firms become arbitrary (Oakey et al., 2010). Previous researchers have also used the Loughran and Ritter (2004) high-technology industrial classification (e.g. Gao et al., 2015; Hoberg & Parabhala, 2009). Thus, the high-technology industrial classification is: Computer Hardware (SIC=3571, 3572, 3575, 3577, 3578), Communication Equipment (SIC= 3661, 3663, 3669), Electronics (SIC= 3671, 3672, 3674, 3675, 3677, 3678, 3679), Navigation Equipment (SIC= 3812), Measuring and Controlling devices (such as lab analytical devices) (SIC= 3823, 3825, 3826, 3827, 3829), Medical Instruments (such as surgical instruments) (SIC= 3841, 3845), Telephone Equipment (SIC= 4812, 4813), Communications Services (SIC= 4899), and Software (SIC= 7371, 7372, 7373, 7374, 7375, 7378, 7379).

A further sample criterion is firm size. Only large firms, defined as greater than 500 employees were selected (Rauch et al., 2009), since larger firms have more slack resources and market dominance to strategically pursue more entrepreneurial endeavours to sustain and grow their wealth and to resist competition from others in the industry and new entrants (Covin & Slevin, 1989; Hughes & Morgan, 2007; Wales et al. 2013c; Zahra & Garvis, 2000). This is not to undermine that other researchers have indicated that smaller organisations are more flexible and able to adapt and cease opportunities in their environments (Rauch et al., 2009). The use of large public organisations rather than small private firms is of relevance to the research context since it is more likely to find reliable data on large publicly-listed organisations. Large organisations have reporting obligations and data that is accessible publicly as part of their public listing status (Miller & Le Breton-Miller, 2011). Furthermore, having only large firms provides a conservative setting for examining the effect of EO on firm-level outcomes, since smaller firms have been shown to have negative outcomes from adopting EO (Wales et al., 2013c). Thereby, most importantly the criteria of only including large firms was applied to provide us with a neutral setting to examine the double-edged nature of EO. As a further refinement, the chosen firms should have R&D spending since R&D constitutes one of the main measures for EO. Firms with no R&D spent (i.e. R&D=0) were excluded before the computation of the variables.

The context of the research is important to consider (e.g. US or UK context, for example). To this end, the US context is more relevant to EO, since it has been shown that US firms generally exhibit higher levels of EO than those in other countries (Kemelgor, 2002). Moreover, the focus on US firms was because the emphasis of this research was not examining cross-country effects, but rather on a context that would provide theoretical insights (Wales, 2016). In certain non-US contexts, it has been shown that EO does not have a significant effect on firm outcomes because of cultural and structural constraints (Kraus et al., 2012). Lastly, there is more data available on publicly traded US companies.

For this thesis, the total number of firm-year observations is 5,011, utilising a sample of 742 firms, along a span of 15 years from 2000 until 2014. Thus, when examining the EO construct objectively, many observations were included for empirical analysis, in which the time dimension could be utilised to increase the number of observations in longitudinal studies (Della Porta & Keating, 2008). Few researchers have examined the longitudinal effects of EO or any of its dimensions on firm performance or failure even though EO is manifest through sustained entrepreneurial behaviour (Covin & Miller, 2014; Covin & Slevin, 1991; Miller, 2011). Thus, there is a need to have a substantial longitudinal timeframe when examining the effect of EO and its different dimensions on firm-level outcomes (Wiklund & Shepherd, 2011). It is insightful to examine the long-term effect of EO from the pre-crisis to post crisis period, which reasons for the inclusion of sufficient number of years prior to the crisis and following the crisis.

Having a large sample size of firms is a requirement in quantitative studies to allow for sufficient data collection and analysis and consequently for the testing of the research questions and hypotheses. Most importantly, in the case of abstract concepts such as EO, there should be a significant number of cases that are examined (Della Porta & Keating, 2008). Large sample sizes decrease sampling errors and improve external validity (Murphy et al., 2014; Scandura & Williams, 2000; Yang et al., 2006). Positivists tend to choose large number of aggregated cases (i.e. firms in this research) to enhance generalisability (Della Porta & Keating, 2008). Sample size affects the statistical significance of the results, and in turn affects the statistical validity of the research (Scandura & Williams, 2000). In this thesis a sample of 742 firms was used to examine the EO/EO dimensions and firm performance/failure relationship. The minimum sample size required for ensuring statistical power when testing hypotheses in this research was calculated to be 231 firms (as explained below).

It is imperative to refer to statistical power analysis using effect size (ES) and significance level alpha to determine the minimum required size for regression analysis (Haynes et al., 2014). Accordingly, the significance level α was set to 0.05, in which α refers to probability of making a type I error of rejecting the null hypothesis (H_0) when the null hypothesis is true (Kim et al., 2004; Murphy et al., 2014). Setting α at 0.05 rather than 0.01 is commonly used since a more lenient statistical significance level would improve the statistical power of the hypothesis testing (Murphy et al., 2014). β refers to the probability of making a type II error of failing to reject the null hypothesis when it is false or the alternative hypothesis (H_1) is true (Cohen, 1992; Murphy et al., 2014). Cohen (1992) recommended that β be equal to α, thereby β is set at 0.05 (Kim et al., 2004). The β probability is relevant to the research's statistical power. The statistical power is calculated as $1\text{-}\beta=0.95$ (Cohen, 1992; Murphy et al., 2014). The statistical power refers to the probability of avoiding a type II error because of sampling error (Cohen, 1992; Murphy et al., 2014). Lastly, the effect size (i.e. size of difference between the null or the population mean and alternative hypothesis or the sample mean) is set to a medium (F-test for regression or f^2 ratio=0.15) (Cohen, 1992), in which most social sciences set the effect size to be medium to ensure that the difference between the population mean and sample mean is large enough to be detectable (Cohen, 1992; Haynes et al., 2014; Kim et al., 2004; Murphy et al., 2014). Small effect size means that the effect is not visible whereas large effect size indicates something is easily visible (Cohen, 1992; Murphy et al., 2014).

The sample size requirement of the overall thesis is calculated as follows. The effect size (f^2=0.15), α=0.05, power=0.95, and the number of predictor variables (including year dummies and controls) is 22; thereby, the recommended sample size is 231 (Haynes et al., 2014; Kim et al., 2004). With the estimated effect size, the sample needed to ensure statistical power is below the sample size of the thesis's research studies. Thereby, this ensures that the thesis would result in valid conclusions when testing hypotheses (Haynes et al., 2014; Kim et al., 2004). However, missing data needs to be accounted for thereby it would result in an unbalanced panel (Haynes et al., 2014).

The use of secondary data from well-established and cited databases such as Wharton Research Data Services (WRDS) gives the researcher greater freedom in using a larger sample size to test the research questions and hypotheses (e.g. Chen et al., 2015; Haynes et al., 2014). Previous researchers in the field of firm-level entrepreneurship have used secondary data from databases in WRDS to conduct their studies (Haynes et al., 2014; Miller & Le Breton-Miller, 2011). WRDS gives access to several databases such as Compustat and Center for Research in Security Prices (CRSP). Compustat-North America is a financial database that includes financial data on more than 30,000 Canadian and US firms. CRSP contains market data and share prices and returns of equities. To merge the datasets (Compustat and CRSP) and code for the data and access the variables that are needed for this doctoral research, Statistical Analysis Software (SAS) was used. The use of SAS allows for large data acquisition and merging of datasets. Furthermore, SAS software is quick in sorting large datasets and for running models through coding. The advantage of SAS is that it is clear in reporting possible bugs in coding in any step the researcher runs thereby minimizing the risk of programming error in the acquisition, sorting and analysis of data.

In summary, the research sample chosen was appropriate for providing the context for examining the EO/EO dimensions and firm performance/failure relationship. The sample size was reasoned by the effect size to improve the statistical power of the hypothesis testing. The use of secondary data allowed for more inclusion of firms. With a greater sample size, the statistical power (i.e. by decreasing sampling errors) of the thesis was improved (Murphy et al., 2014).

The next section will outline the mean values of EO in the sample of firms in the high-technology industry versus the mean values of EO among the sample of firms that were excluded from the analysis. This provides validation for the choice of the high-technology industry to examine the EO and firm performance relationship.

4.6 EO Mean values for High-technology versus Excluded Sample

The examination of the entrepreneurial orientation and firm performance relationship was conducted in the context of the high-technology industry since it demonstrates more entrepreneurial orientation than a non-technology oriented industry (Covin et al., 1990; Patel et al., 2015).

The operationalisation and definitions of the EO construct as well as its dimensions are presented in chapter 5, Study 1 of this thesis. The information regarding their definition, measurement, and source of data are summarised in table 5.1 in chapter 5.

Below are descriptive statistics of the overall set of firms from the Compustat-CRSP merged file, from 2000 until 2014, among the high-technology firms versus firms not included in the Study. As can be shown in table 4.1, the high-technology industry mean statistics of EO is 0.46 whereas the excluded sample of firms had a mean value of -0.29. This indicates that the examination of EO and its main dimensions' relationship with firm performance is relevant in the high-technology industry as EO constitutes the main variable under examination in this overall thesis.

The results that the mean value of EO is higher in the high-technology industry provides support for part of the hypothesis *H5* of this thesis, that high-technology firms are more entrepreneurially oriented.

Interestingly, the mean of proactiveness among firms that belong to the high-technology industry was -0.14, which is below the mean of proactiveness among the excluded sample of firms. This indicates that firms in the high-technology industry are being less proactive i.e. retaining less. By examining the overall gestalt EO construct, one would not be able to realise that proactiveness, one of the main dimensions of EO, was lower in firms belonging to the high-technology industry in comparison to excluded sample of firms. Concerning the other dimensions of EO, the mean values of innovativeness and risk taking were higher among the firms in the high-technology industry.

Table 4.1: Mean Values of EO and its Dimensions in High-technology Firms versus Excluded Sample of Firms

Standardised Variables	High-technology Firms	Excluded sample
EO	0.46	-0.29
Innovativeness	0.48	-0.28
Proactiveness	-0.14	0.08
Risk taking	0.16	-0.09

4.7 Chapter Conclusion

The significance of this chapter is to indicate the guidance of the research philosophical position (i.e. ontology: objectivism and epistemology: scientific realism), the methodology (quantitative), the methods chosen (SAS software coding of variables), as well as the sources of data (WRDS platform secondary data). The theoretical underpinnings guided the inclusion of variables and their computations. This research in turn followed a deductive strategy (starting with theory and testing hypotheses based on the theoretical foundations of the research). This doctoral research is thereby research-led.

The next chapter will describe Study 1: (examining the effect of EO and its dimensions on firm performance measures among surviving and failed firms), in which the reasoning behind the variables' selection is based on the theory of this doctoral research (organisational learning and prospect theory).

Chapter 5

Research Methodology for Study 1:

Examining EO and its Dimensions and Firm Performance Relationship

5.1 Introduction to the Chapter

This chapter describes the main variables (predictor, dependent, and control variables) that were included in Study 1. In Study 1, the focus was on the EO-firm performance relationship. It sought to answer the research question: What is the longitudinal effect of EO and each of its dimensions on the short-term and long-term firm performance? In Study 2, the focus was on the EO-firm failure relationship. The same measures of EO and some of the control variables that were utilised in Study 1 were also used in Study 2. The EO-as-Experimentation perspective guided the hypotheses that were generated referring to the EO and firm performance/failure relationship. The EO-as-Experimentation perspective considers that EO would not only lead to higher performance among surviving firms, as the literature predominantly agrees, but would increase chances of failure among non-surviving firms as well (Revilla et al., 2016; Wiklund & Shepherd, 2011). Non-surviving firms, that were identified based on the status alert (STALT item) in Compustat, were also included and had undergone a separate analysis from the surviving firms. The firms had a unique identifier in the panel dataset (i.e. gvkey) and each firm had several observations, thus the form of the dataset was a panel, which included a cross-sectional and a time-series dimension.

Each dimension of EO (innovativeness, proactiveness, and risk taking) was operationalised independently and this is consistent with the multi-dimensional conceptualisation of EO in this research. This thesis also acknowledges the multi-dimensional view of organisational performance (Gupta & Wales, 2017; Ketchen et al., 2006; Lumpkin & Dess, 1996; Rauch et al., 2009). Venkatraman and Ramanujam (1986) identified the dimensionality of firm performance as consisting of financial (such as growth, accounting and stock market returns) and non-financial measures (such as organisational effectiveness and operational performance). Most of the entrepreneurship literature has focused on the financial aspect of firm performance due to the theoretical and conceptual argument that EO has a considerable effect on financial performance (Rauch et al., 2009). However, the literature agrees on the positive effect of EO on financial firm performance (Rauch et al., 2009; Zahra & Covin, 1995). Study 1 focused on financial and market-based performance measures when examining the effect of EO on firm performance in each of the surviving and failed or inactive firms to challenge the EO-as-Advantage perspective.

The inclusion of the variables in the overall thesis is based upon the theoretical foundation of organisational learning and prospect theory. The following section will first outline the measurement of the dependent variables, organisational performance measures (Tobin's Q and Return on Assets). Subsequently, it will present each of the predictor variables (EO dimensions) and the control variables. It will also outline a description of the regression model and its assumptions chosen for Study 1. Study 1 has been designed to test hypotheses *H*1, *H*2a and *H*2b, *H*3a and *H*3b, *H*6a, *H*6b, *H*7a, *H*7b, *H*8a, and *H*8b.

5.2 Variables for Study 1

This section will start by outlining the firm performance measures followed by the measurement of each of the EO dimensions, and lastly focus on the control variables. It will also outline the reasoning behind the inclusion of the variables, their sources, and computations. The computations of each of the EO dimensions are constructed to be consistent with their definitions. The computations of the variables refer to the data items that are outlined in the appendix. It is noteworthy to point that all the variables tested in the regression were winsorized to eliminate the effect of outliers (i.e. the transformation of extreme values below the 1^{st} percentile and above the 99^{th} percentile to their respective 1^{st} and 99^{th} percentiles) and standardized (i.e. converting variables to have a mean of zero and standard deviation of 1) (Miller & Le Breton-Miller, 2011).

5.2.1 Dependent Variables: Firm Performance Measures

The purpose of this section is to identify the different firm performance measures that were included and their opertionalisation.

The financial performance measures of interest to this research were profitability (represented by accounting returns or return on assets (ROA)), and stock market returns (Tobin's Q). There are major differences between the accounting-based and market-based measures of firm performance. The reason for including both is to have a better representation of the multi-dimensionality characterisation of firm performance (Gupta & Wales, 2017; Haynes et al., 2014).

Market-based measures of firm performance were the main firm performance measures chosen for Study 1 since accounting-based measures are more inclined to be manipulated by executives (Haynes et al., 2014). Furthermore, scholars have advocated the use of market-based measures, such as Tobin's Q, rather than accounting-based measures of firm performance such as ROA, ROE (return on equity), and ROI (return on investment) (Dalton & Aguinis, 2013; Villalonga & Amit, 2006). As such the Tobin's Q measure can signify growth prospects as well (Lang & Stulz, 1994). Even though most of the studies on EO have used accounting-based measures when assessing outcomes of EO (Rauch et al., 2009), Dalton and Aguinis (2013) noted that such measures suffer from contamination and deficiency since they do not convey the direct benefit to shareholders. Market-based measures of firm performance represent the long-term firm value and the investor's valuation of firm performance (Haynes et al., 2014). Yet, it is better to include both measures of firm performance (Gupta & Wales, 2017). Thus, to capture the multi-dimensional nature of firm performances, ROA was also included in Study 1. Such performance measures were obtained from Compustat.

5.2.1.1 First Firm Performance Measure

The first measure of performance represents long-term firm performance, which was measured by Tobin's Q.

Tobin's Q: Tobin's Q is a common measure of firm performance used in the entrepreneurship literature (Andrews & Welbourne, 2000), which assesses the valuation of the firm's stock market value relative to the replacement cost of its assets (Mehran, 1995). Tobin's Q is considered as an indicator of a firm's long-term performance (Lin et al., 2006). Unlike short-term measures of firm performance, Tobin's Q signifies risk and return components (Lin et al., 2006). The reason that Tobin's Q has been used commonly in the entrepreneurship literature is that it can represent the market reaction to the firm's innovation (Gao et al., 2015). Such a ratio represents the ratio of the firm's market value to book value of assets (Adams & Santos, 2006; Miller & Le Breton-Miller, 2011). The advantage of Tobin's Q is that it captures the value of EO within capital markets (Gupta et al., 2016). Tobin's Q represents a ‘parsimonious measure’ of valuation that has been long used in the economics literature and is grounded in economic theory (Montgomery & Wernerfelt, 1988). It is a forward-looking measure that adjusts and accounts for the risk, it encompasses short and long-term aspects of performance (Gupta et al., 2016; Uotila et al., 2009), includes an assessment for expected outcomes of the firm’s performance in future markets (Dushnitsky & Lenox, 2006), and is not likely to be manipulated by managers (Lindenberg & Ross, 1981). Market-based measures have been frequently used in research that encompasses a long-time horizon (e.g. Lin et al., 2006; Uotila et al., 2009).

Miller and Le Breton-Miller (2011) computed Tobin’s Q as such: {(common shares outstanding × calendar year closing price) + (current liabilities–current assets) + long-term debt + liquidating value of preferred stock)}/ by total assets. Thus, according to Compustat items, it was computed as: (CSHO*PRCC_C) +(LCT-ACT) +DLTT+PSTKL)/AT. The data was obtained from Compustat.

5.2.1.2 Second Firm Performance Measure

The second measure of firm performance was the short-term firm performance (ROA).

Short-term firm performance: Short-term firm performance (ROA) is a profitability accounting-based measure of a firm’s financial performance. It is an indicator of the firm’s degree of efficiency in utilising its current assets (Carpenter et al., 2001). It was computed as net income before extraordinary items (IB)/total assets (AT) (Haynes et al., 2014; Klein, 2002) from Compustat.

The next section will outline the independent variables that were used starting with the EO dimensions and the EO construct followed by the control variables.

5.2.2 EO Dimensions

This section outlines the EO dimensions that were included in the overall thesis (i.e. the main dimensions of EO, which include innovativeness, proactiveness, and risk taking). EO was measured using proxies, since they are quantitative indirect measures of EO in contrast to the classic Covin and Slevin (1989) psychometric subjective scale (Miller, 2011). Archival data has been long used to develop proxy measures to represent theoretical concepts. Proxy variables represent a latent, unobservable construct (Ketchen et al., 2013). Each of the dimensions of EO was examined independently. Previous researchers, even those who have used proxies to convey EO (Miller & Le Breton-Miller, 2011), have combined the EO dimensions into an EO index. This in turn masks the independent effects of each of the EO dimensions on firm-level outcomes (Hughes & Morgan, 2007; Lumpkin & Dess, 1996). Thus, it is vital to examine each of these proxies of EO independently.

5.2.2.1 Innovativeness

The following section presents the different measurements that were used in the Study to measure innovativeness. Measurement 1 and 3 represent the inputs into the innovation or R&D-based process, whereas measurement 2 represents the outputs of innovativeness (Swift, 2016).

5.2.2.1.1 First Measurement of Innovativeness

Firms that invest more in R&D are inclined to be more innovative (Hall et al., 2005; Lee & O’Neill, 2003). The innovativeness dimension of EO has been defined as technological experimentation through investing in R&D (Lumpkin & Dess, 1996; Miller, 1983). Thus, innovativeness was computed as R&D expenditure divided by the total assets. The source of the data was from Compustat. The measurement based on Compustat items was XRD/AT. This measure of innovativeness is termed R&D intensity (Hall et al., 2005). R&D intensity as represented by R&D expenditure divided by total assets was used instead of R&D expenditure divided by total sales since the latter has been used to proxy firm growth opportunities (Anderson & Reeb, 2003). Ketchen et al. (2013) noted that there are issues with associating the innovativeness dimension of EO with greater spending in R&D. R&D expenditures consider the expenses incurred in both the research and development phases. However, it is important to consider the research productivity as well by examining patent data.

5.2.2.1.2 Second Measurement of Innovativeness

Patent data captures research productivity (Seru, 2014) and signals the success of the R&D of the firm to outside investors (Seru, 2014). A patent has an application date (the date the patent was applied for) and a grant date (the date that it was eventually granted). Since patent application date is better in capturing the actual time of innovation, then it was used to count the patent number for each firm (Hall et al., 2005). That is, the patent count is the number of filed patent applications that were granted.

Patent data, however, has its own imperfections. There is a truncation bias, since towards the end of the sample there is an average lag of two to three years between the time the patent was applied for until the patent is granted (Dass et al., 2017). Furthermore, the USPTO (US patent office) releases the patent applications only after the patent has been granted (Dass et al., 2017). To adjust for this truncation bias, Dass and authors (2017) aimed to test the methods in the literature to adjust for truncation bias by comparing the NBER dataset until 2006 with the updated extended patent dataset until 2010 by Li et al. (2014). The findings of Dass et al. (2017) showed that the methods used to adjust for the truncation bias (Hall et al., 2005) are not sufficient to exclude the bias. Thereby, it was shown that one should exclude the last three to five years from the patent dataset to have a truncation bias free patent dataset. This shows that the Li and authors (2014) dataset that was extended until 2010 fairly has a truncation bias free sample until 2006 when compared with the NBER patent dataset. When counting the patent applications, Study 1 dataset excluded patent information from years 2007 until 2010.

The patent data that was used was that of utility patents (i.e. inventions) (Kogan et al., 2012; Li et al., 2014). The NBER patent project database contains data on patents that were merged with Compustat (i.e. firm identifier gvkey) from years 1975 until 2006. This patent dataset was extended by Kogan et al. (2012) and Li et al. (2014).

Patent yield was measured by the number of patents at application date divided by R&D (Hall et al., 2005). However, this research is not interested in the importance of the output or the patent quality so patent citations were not collected, and patent count sufficed for the underlying research. This research did not distinguish between radical or incremental innovation (Gao et al., 2015). The patent data was then merged with Compustat/CRSP merged file from 2000 until 2006 based on the CRSP identifier Permno, which was supplied by Kogan et al. (2012).

5.2.2.1.3 Third Measurement of Innovativeness

Another important measure of innovativeness is resource intangibility, which has been measured as R&D expenditure divided by total number of employees (XRD/EMP) (Campbell et al., 2012). The reason for measuring R&D per employee is that innovation endeavours require more labour (Holmstorm, 1989). Furthermore, such a variable is important to compute, since firms with greater level of intangible resources allow their CEOs to have greater latitude of action and engage in opportunistic behaviour (Campbell et al., 2012). Thus, agency costs become higher in the firm as level of resource intangibility increases. The computation of this measure of innovativeness based on Compustat items was XRD/EMP.

5.2.2.2 Proactiveness

Proactiveness or proactive engagement was represented by the percentage of annual earnings reinvested in the company, which is retained earnings divided by total assets (Miller & Le Breton-Miller, 2011). The source of proactiveness measure was from Compustat. Based on the Compustat items, the measurement was RE/AT. The measurement of proactiveness was consistent with its definition (anticipating future demand and retaining resources to ensure the firm’s market positioning) (Miller, 1983). The use of this measure, instead of an immediate specific investment, is useful since it symbolises a firm’s overall proactiveness of building up its business on the long run rather than just anticipating current moves (Kaplan & Zingales, 1997). However, it does have its limitations, in which the nature of the investments cannot be known. Regardless, taking several firms along a longitudinal period was appropriate to compute proactiveness (Miller & Le Breton-Miller, 2011).

5.2.2.3 Risk taking

Risk taking dimension of EO represents the unsystematic risk or idiosyncratic risk (portion unattributed or unexplained by the industry) of the firm. The daily stock return file was used from CRSP when computing the idiosyncratic risk, which represents the risk in terms of equity. Idiosyncratic risk is measured as the standard deviation of residuals from the regression of running the daily stock returns (raw returns minus the risk-free rate) on the value weighted market returns (value-weighted returns minus the risk-free rate) (Hoberg & Parabhala, 2009; Miller & Le Breton-Miller, 2011). The idiosyncratic risk was re-adjusted based on fiscal year. The measurement of the risk taking dimension is consistent with its definition as being firm-specific and is associated with the fluctuations in the firm's share prices. Miller and Le Breton-Miller's (2011) construction of unsystematic risk reflects management's tendency to pursue risky endeavours (Kreiser et al., 2013). The source of the risk taking measure of EO was from CRSP.

5.2.3 EO Construct

In addition to examining the independent effects of each of the EO dimensions on firm performance, this research investigated the overall effect of EO on firm performance measures. The standardised values of the EO dimensions were added to compute an EO index to corroborate the stream of research on the EO-firm performance relationship (Miller, 2011; Miller & Le Breton-Miller, 2011).

The next section will indicate the firm-related control variables that were included when examining the EO and firm performance relationship.

5.2.4 Firm-Level Control Variables

The purpose of this section is to signify the importance of controlling for certain variables that may influence the variables, which are EO and firm performance. Some variables are known to influence firm performance (e.g. investment opportunity, leverage, liquidity) whereas some variables are known to affect the EO-firm performance relationship (e.g. systematic risk, firm age, firm size). Thus, relevant control variables were included in order to measure the effect of each of the EO dimensions on firm performance measures while protecting against alternative explanations for any relationships that emerge.

5.2.4.1 Investment opportunity

Investment opportunity has been shown to influence firm value (Anderson & Reeb, 2003; Harford et al., 2008). From an agency perspective, investment opportunity must be controlled as weakly-governed firms and managers who seek personal wealth might seek more investments and capital expenditures. This might affect the firm value negatively (Harford et al., 2008). Harford and Li (2007) have shown that investments increase CEO wealth and compensation, but decrease firm value. Thus, investment should be controlled as it influences firm performance measures. Investment was calculated as capital expenditures (CAPX) divided by lagged or beginning of year long-term assets (equipment, property, and plant) (Lagged PPENT) (Campbell et al., 2011; Malmendier & Tate, 2005). This is an accounting-based measure of investment opportunity. The source of investment opportunity was from Compustat.

5.2.4.2 Firm age

Firm age was included since it has been shown to affect the EO and firm performance relationship (Miller & Le Breton-Miller, 2011; Rauch et al., 2009). Two different measurements of firm age were included in the Study.

5.2.4.2.1 First Measurement of Firm age

Firm age was computed as the difference between the observation year and the firm's listing year in CRSP (Bebchuk et al., 2011; Huang & Ramirez, 2010). It has been argued that listing age has more economical meaning than founding year, since the listing year is a significant time in a company's life and affects ownership and governance structure, and improves the firm's opportunities for growth (Bebchuk et al., 2011). Thus, it is of relevance to compute firm's listing age in this research. The firm age was computed as the year the firm was first listed on CRSP subtracted from the observation year. The lowest allowed value of firm age was zero since the firm's observation in Compustat might occur before the listing year in CRSP. Negative values of firm age were set to zero.

5.2.4.2.2 Second Measurement of Firm age

To ensure the robustness of the measure, an alternative measure of firm age was used based on the founding date of the firm. The source of the founding dates is not available in Compustat, so the founding dates of firms was obtained from Loughran and Ritter (2004) dataset available on 12,719 firms, with the CRSP identifier, from 1975-2016 (which has been updated until February 2017). The dataset was merged with the Compustat/CRSP merged file using the CRSP firm identifier. The missing values of the founding dates of some of the firms were obtained from company websites. The firm age measures based on the listing year and the founding year were logged.

5.2.4.3 Firm size

Firm size was included since it can affect the EO and firm performance relationship (Miller & Le Breton-Miller, 2011; Rauch et al., 2009; Wiklund & Shepherd, 2005). Firm size was computed as the log value of the number of employees (EMP) (Wooldridge, 2015), which is in line with the definition of firm size outlined in Chapter 4 (i.e. large firms were classified based on the number of employees (more than 500 employees) (Rauch et al., 2009). The source of firm size was from Compustat.

5.2.4.4 Liquidity

Liquidity influences a firm’s performance as well as the EO-firm performance relationship as the availability of slack resources can promote EO (Wiklund & Shepherd, 2005). It was computed as cash and short-term investments divided by total assets (CHE/AT) (Harford et al., 2008). The source was from Compustat.

5.2.4.5 Leverage

Leverage has been shown to affect a firm’s performance. Thus, it was included as a control variable. It was computed as short-term and long-term debt divided by total assets (DLC/DLTT) (Harford et al., 2008). The source was from Compustat.

5.2.4.6 Systematic Risk

Systematic risk (market risk or Beta) was also included in the analysis to control its effect on the risk taking behaviour of firms (the risk taking component of EO) (Miller & Le Breton-Miller, 2011). The systematic risk variable was computed through two alternative measurements.

5.2.4.6.1 First Measurement of Systematic Risk

The first measurement of systematic risk represents the value-weighted market returns (Miller & Le Breton-Miller, 2011). The market risk measure was computed from the stock file in CRSP similar to the unsystematic risk (Miller & Le Breton-Miller, 2011).

5.2.4.6.2 Second Measurement of Systematic Risk

The alternative measure of systematic risk was based on the standard deviation of the regression used to predict unsystematic risk (Hoberg & Parabhala, 2009).

5.2.5 Section Conclusion

This section emphasised the operationalisation of the different dimensions of EO as well as their sources. The reasoning behind the measurement of each of the EO dimensions: risk taking (unsystematic risk), proactiveness (RE/total assets), and innovativeness (R&D intensity and patent yield) was based on their definitions. Contrary to most studies, which opertionalise EO as an overall index; this thesis opertionalised EO into its different dimensions. However, for the sake of comparison, the EO dimensions were also combined into a single EO construct. The reason for doing so is to indicate that when EO dimensions are combined into an EO index, the independent effects of each of the dimensions are masked.

This research relied on market-based measures of firm performance rather than accounting-based measures of firm performance, as the latter might be subject to managerial manipulation. Having dependent variables such as Tobin's Q would give an unbiased conservative setting. However, this is not to disregard the applicability of other financial measures of firm performance, which were used to represent the multi-dimensional nature of firm performance as well (i.e. ROA).

Control variables were also included in Study 1 when examining the EO and firm performance relationship as certain variables were shown in the literature to affect the EO and firm performance relationship.

The next section will outline the time measurement of the predictor and dependent variable of the regression.

5.3 Time Measurement of Variables

This section indicates how the different variables (dependent and predictor variables) were measured. Measuring the variables using the objective data and at different times avoids common method bias and cross-sectional bias, issues common in cross-sectional survey designs (Ployhart & Vandenberg, 2010). This was achieved in this thesis through the panel longitudinal design (a time-series cross sectional form of data). The main predictor variables, EO and its various components (innovativeness, proactiveness, and risk taking) were measured at time T. Whereas the dependent variables (Tobin's Q and ROA) were measured at time T to examine the effect of entrepreneurial orientation on firm performance. This was done to identify the causal effect of EO on firm performance. Through this thesis, we were able to test the long-term effect of EO on firm performance in a panel longitudinal design.

Even though the longitudinal form of the dataset would enable the inference of cause-effect relationships, there is an issue of the risk of endogeneity or reverse causality. The next section 5.3.1 will address this issue further.

5.3.1 Issues of Endogeneity

Endogeneity bias can arise either from an omitted variable bias or a simultaneous causality problem. An omitted variable bias occurs when there is an endogenous predictor variable regressor (x) in the model, which is related to other overlooked unobserved variables not included in the regression model. This results in a correlation between the error term in the regression and the predictor variable x (Antonakis et al., 2014). Theory is the guidance to the research and this is the best guarantee for mitigating the problem of an omitted variable bias (Antonakis et al., 2014).

The endogeneity problem of an omitted variable bias can be tested through a Hausman endogeneity test (Hausman, 1978), which tests for the appropriateness of the regression model (panel fixed effect versus random effect model). A fixed effect regression can control for any overlooked variables that are constant throughout time and that are not included in the model. By using a fixed effect regression, we could control for an omitted variable bias if the variables that were overlooked in the model are constant throughout time (e.g. industry) (Wooldridge, 2015). The effect of the variables on the outcome (firm performance) could be studied by controlling for any overlooked variables (Haynes et al., 2014; Hilary & Hsu, 2011). Most EO researchers have assumed the cause-effect relationship between EO and firm performance, without examining such a relationship in the right setting (Wiklund & Shepherd, 2011). Thus, there is a problem of endogeneity within EO research (Miller, 2011). Endogeneity problems represent critical issues in the management literature when examining cause-effect relationships, yet it has received limited attention among management scholars (Zaefarian, 2017). The omitted variable bias is mitigated through the fixed effect within-group estimator that controls for fixed variables over time.

Simultaneity, whereby the dependent variable and independent variables cause each other (Wooldridge, 2010) could bias the results. In Study 1, simultaneity problems might arise if good performance may cause or facilitate EO as well (Miller & Le Breton-Miller, 2011). Thus, to eliminate the issue of endogeneity, the Sargan-Hansen test (Hansen, 1982; Sargan, 1958) was used and the lagged values of EO were used as an instrument. The results of the endogeneity test will either indicate that EO is exogenous (when the null hypothesis of exogeneity is accepted) or endogenous. If the test indicates that EO is exogenous then the fixed effect regression's Betas are consistent. The endogeneity tests are shown in sections 7.10 and 8.8 of chapter 7 and 8, respectively.

The next section will consider the statistical methods chosen for Study 1 and the regression model adopted.

5.4 Synopsis to the Regression Model of Study 1

This section provides a brief description of the analysis method chosen for Study 1. SAS was used to compute the Study variables and merge the datasets (Compustat, CRSP). SAS can handle different datasets at once and is powerful in data management. However, STATA was used to run regressions due to the ease of its usage and its powerful regression aspect compared to SAS. STATA software is a statistical package tool used to analyse data mostly for regressions (Cameron & Trivedi, 2010).

The form of the data was a panel longitudinal design, in which the firm-level data was structured as multiple variables across multiple years (2000-2014). The time factor (T= 15 years) is less than the N factor (sample size = total of 341 survived firms and 401 inactive firms).

To test the appropriateness of the model, a fixed versus random effect regression model was tested through a Hausman test. A fixed effect regression generates consistent estimators whereas a random effect regression generates efficient estimators. If there is an endogeneity problem of an omitted variable bias (i.e. there is a correlation between x and the error term), then the efficient estimators are not consistent or biased. Thus, the random effect regression would be rejected (Antonakis et al., 2014; Wooldridge, 2015).

The next section will consider the steps to test for the appropriateness of the fixed effect model.

5.5 Fixed Effect Regression Appropriateness Test

The steps of the test for the appropriateness of the fixed effect regression model is shown in figure 5.1. The F-test examines the appropriateness of the fixed effect regression when faced with the choice of whether to use a pooled OLS model or a panel model. The panel fixed effect regression has several advantages over a pooled OLS as it accounts for the heterogeneity in the firms and can also deal with the issue of a fixed omitted variable bias. To show that a fixed effect is more appropriate than the pooled OLS, the F-test indicates the significance of the fixed effect regressors from zero. If the F-test is significant then this means that the regression parameters vary across the sample of firms and that the fixed effect model is a better model than the pooled OLS (Wooldridge, 2015).

The Breusch-Pagan LM test (Langrange Multiplier) is then conducted to show whether a panel random effect model or a simple OLS model better fits the data (Breusch and Pagan, 1980). That is, the LM test, similar to the F-test, indicates whether the variance across the firms in the dataset is zero or if there are significant effects to the firm observations (i.e. a panel effect). The LM test is conducted after running a random effect model. The null hypothesis of the LM test is that the variance of the random effect is zero. When the null hypothesis of the LM test is rejected, the panel random effect is shown to be a better model. Then, the choice falls into either a panel fixed or a random effect regression model, which is tested by the Hausman test (Cameron & Trivedi, 2010; Wooldridge, 2015).

For estimating ‘ceteris paribus’ effects, the fixed effect regression is more desirable or consistent than the random effect estimator since it allows correlation with the fixed component of the error term and eliminates or controls for the fixed effects (Cameron & Trivedi, 2010; Wooldridge, 2015).

Hausman (1978) constructed a test that would allow researchers to determine whether a panel fixed effect or a random effect regression is more appropriate. However, the Hausman test is not enough to conclude that a fixed effect regression model is more appropriate. Rather, it is also important to test the assumptions of the fixed effect estimator (Baltagi, 2013). The null hypothesis of the Hausman test considers that the variation among the observations is random and that the unobserved individual heterogeneity is uncorrelated with the explanatory variables (Cameron & Trivedi, 2010). The rejection of the null hypothesis of the Hausman test means that the key assumption of the random effect estimator, explanatory variables are uncorrelated with the unobserved effect, is violated (Wooldridge, 2015).

Since the Hausman test assumes that the panel random effect regression is fully efficient, then a cluster-robust version of the Hausman test, which is robust to within firm autocorrelation and heteroskedasticity, is also conducted after running a robust random effects model.

The next section outlines the assumptions of the regression model of Study 1.

5.6 Fixed Effect Regression Model Specification and Assumptions

The following section considers the regression model or equations that are tested in Study 1. After outlining the regression models, the regression assumptions are considered.

5.6.1 Fixed Effect Regression Equations

The regression models which examine the effects of the predictor variables against the dependent variables are outlined below. Below, there are two regression models, in which one considers the effects of the EO dimensions and the other equation considers the effect of the overall EO construct on firm-level outcomes (Tobin's Q or ROA).

a) $\text{Tobin'sQ/ROA}_{gvkey,time}=B_1\text{Innovativeness}_{gvkey,t}+B_2\text{Proactiveness}_{gvkey,t}+B_3\text{Risk taking}_{gvkey,t}+B_4\text{Systematic risk}_{gvkey,t}+B_5\text{Investment Opportunity}_{gvkey,t}+B_6\text{Firm size}_{gvkey,t}+B_7\text{Firm age}_{gvkey,t} + B_8\text{Leverage}_{gvkey,t}+ B_9\text{Liquidity}_{gvkey,t} +\sum^{t-1} \sigma_j T_j+U_{gvkey,t}$

b) $\text{Tobin'sQ/ROA}_{gvkey,time}= B_1\text{EO}_{gvkey,t}+B_2\text{Systematic risk}_{gvkey,t}+B_3\text{Investment Opportunity}_{gvkey,t}+B_4\text{Firm size}_{gvkey,t}+B_5\text{Firm age}_{gvkey,t} + B_6\text{Leverage}_{gvkey,t} +B_7\text{Liquidity}_{gvkey,t} +\Sigma^{t-1}\sigma_j T_j+U_{gvkey,t}$.

In the first equation above (5.6.1 a), the main predictor variables are the EO dimensions: innovativeness, proactiveness, and risk taking (unsystematic risk) and the rest of the variables are the control variables. An accounting measure of firm performance (ROA) and a market measure of firm performance (Tobin's Q) were included as the dependent or predicted variables. Most importantly, the EO dimensions were run in separate regressions to eliminate the effect of multicollinearity between the three dimensions of EO on the statistical results. The second regression equation (5.6.1 b) considers the overall effect of EO on both measures of firm performance (Tobin's Q and ROA). The variables that were included in the model are variables that vary over time and across firms since the coefficient of a time-invariant variable would not be estimated in a fixed effect model (Cameron & Trivedi, 2010). Since none of the explanatory variables are constant over time, then a fixed effect regression was considered.

As shown in the above equations, Beta are the coefficients of the regressors. Thereby, the relationship between the regressors and the dependent variable is assumed to be linear. The assumptions of the fixed effect regression, such as linearity, were tested in subsequent sections to ensure the fitness of the model.

The remainder of the error in the above regression models, which is called the idiosyncratic error represented by U is the time-varying component of the error and represents time-varying unobservable variables that influence the dependent variable (Cameron & Trivedi, 2010; Wooldridge, 2015). The idiosyncratic errors are represented by residuals that are estimated from the sample of firms. The residuals characterise the deviation of the observed values of the variables from the estimated values of the regression (Wooldridge, 2015).

A panel regression differs from cross-sectional or time-series regression in that it accounts for both the variability in individuals (individual-level effects) as well as the variability over time (time-specific effect) (Baltagi, 2013). As in the two models above (5.6.1 a and b), it was shown that for each variable there was a time factor for the time-series dimension and gvkey or the firm identifier for the cross-sectional dimension. There was also a time effect that was included in the regression equation, hence the model is called two-way fixed and time effect model. Thus, the model accounts for both the unobservable fixed individual effects and the time effects (Baltagi, 2013; Cameron & Trivedi, 2010). The time effect was included as it was shown by the regression testing that the time effect had a significant effect on the firm performance measures, which will be shown in chapters 7 and 8. In a two-way panel fixed effect model there is no intercept, the constant term reported from STATA captures the time average of the average fixed individual effects.

The fixed effect regression essentially computes the change across time in the relationship between the explanatory variables and the outcome variable within each cross-sectional observation or firm. Thus, the fixed effect estimator is also called the 'within-transformation' in which the fixed effect estimator is calculated by mean differencing of each variable within each firm (Cameron & Trivedi, 2010; Wooldridge, 2015). The fixed effect regression is desirable since it controls for the individual specific unobservable heterogeneity or explanatory variables which are time-invariant such as the industry (Hsiao, 2014; Wooldridge, 2015). Thereby, an endogeneity problem of an omitted variable bias was not of a concern in the regressions that were conducted.

The next section will consider the fixed effect regression assumptions.

5.6.2 Fixed Effect Regression Assumptions

According to Wooldridge (2015), there are six essential assumptions when running a fixed effect regression. That firstly, the sample is a random sample. The sample of the high-technology large firms was randomly drawn from the Compustat-CRSP merged database from WRDS. A fixed effect regression also assumes, similar to an OLS regression, that the relationship between the dependent variable and the regressors is a linear relationship.

The second assumption is that the explanatory variables vary over time and that there is no perfect linear relationship among the variables (i.e. multicollinearity). The reason why variables should vary over time in a fixed effect regression is that the fixed effect regression would cancel out the effect of the variables that are fixed over time. Multicollinearity was tested through the VIF (variance inflation factor) of each of the explanatory variables. The importance of the VIF is setting a cut-off point above which multicollinearity would be an issue. Most researchers consider above the value of 10 to be an issue of multicollinearity (Wooldridge, 2015). Multicollinearity was also tested by the regression correlation coefficients. If the correlation coefficient between two regressors is higher than 0.8, then multicollinearity would potentially be an issue (Gujarati, 2003).

The third assumption of the fixed effect regression is the exogeneity assumption, which states that the time-varying unobserved characteristics for each of the firms included are exogenous to the firm. This means that they should not be correlated with the other firm characteristics included in the analysis. Thereby, the explanatory variables and the idiosyncratic errors should not be correlated. However, the fixed effect regression allows for correlation or endogeneity between the unobserved fixed time-invariant component of the error and the explanatory variables (Cameron & Trivedi, 2010; Wooldridge, 2015). Thus, the fixed effect regression allows one to control for endogeneity issues between the explanatory variables and the time-invariant component of the error term.

The fourth assumption is that the idiosyncratic errors are homoscedastic (meaning that the idiosyncratic unobserved errors have the same constant variance given all the explanatory variables for each firm). If the variance of the error term changes with any of the explanatory variables then heteroscedasticity is present (Wooldridge, 2015).

The last important assumption is that the idiosyncratic errors are uncorrelated. However, in the case of panel data, the OLS standard errors would be biased due to cross-sectional dependence, in which each period is not independent of previous periods (Drukker, 2003).

Under all these assumptions the fixed effect estimator is the best linear unbiased estimator. Thereby, the 6^{th} assumption which is the normality assumption of the idiosyncratic errors is unnecessary as the other assumptions (Wooldridge, 2015).

The central limit theorem or asymptotic theory states that as the sample size or number of observations increases, then the distribution of the sample becomes closer to a normal distribution. Since the thesis included a large sample size of 742 firms and 5,011 observations, the panel fixed effect estimators are asymptotically normal implying that they are close to a normal distribution given the large sample size (Wooldridge, 2015).

The next section will consider the assessment for the fitness of the regression model.

5.6.3 Fitness of the Regression Model

The fitness of the regression model is based upon the adjusted R-squared value and the F-test of the regression. The R-squared value of the regression is called the coefficient of determination. It is the ratio of the squared variation that is explained by the regression (explained sum of squares or SSE) divided by the total variation (total sum of squares or SST). It is a value between zero and one (Wooldridge, 2015). The R-squared shows how well the predictor variables explain the dependent variable and thus represents the variation in Y that is explained by the X variables. The R-squared value is a measure of goodness of fit (Wooldridge, 2015). Yet, too much emphasis should not be placed on the R-squared for evaluating a regression equation, as a small R-squared does not mean that the regression equation is useless (Wooldridge, 2015). Most importantly, the R-squared is biased since every time a predictor is added onto the model it increases. Thereby the R-squared should be adjusted for the number of predictors and number of firms in the model.

The F-test assesses the appropriateness of the model and examines the overall significance of the regression model. This is important to consider rather than simply assessing the regression model based on the R-squared (Wooldridge, 2015). To test the fitness of the fixed effect regression model, the F-test (which is automatically reported after running a fixed effect regression) shows the probability that all coefficients in the fixed effect regression is equal to zero (i.e. null hypothesis of all the regression coefficients is zero). The test of poolability of the data arises when one is dealing with panel data (Baltagi, 2013).

The next section will consider the test of the significance of the time in the panel regression model.

5.6.4 Time Effect Test

To test whether time dummies are necessary to include in the regression models, then the significance of the time effect was tested in the Study’s regression models. If the probability of the time effect test of all the time dummies is jointly equal to zero, then one fails to reject the null hypothesis. If otherwise the null hypothesis is rejected, then time dummies are required to include in the regression models. To create the time dummies then a dichotomous variable with either a value of zero or 1 is created for each fiscal year. The time dummies are included in the regression (excluding one fiscal year dummy to avoid the dummy-variable trap) (Cameron & Trivedi, 2010).

The next section will consider the reasoning behind conducting regression analysis among the sample of firms that are surviving separately from the set of firms that have failed.

5.7 Separation of Analysis among Surviving and Failed Firms

The fixed effect regression analysis of the EO and its dimensions and the firm performance relationship of Study 1 was conducted among the dataset of the surviving firms separately from the failed firms (analysis chapter 7 conducted among the sample of surviving firms and analysis chapter 8 among the sample of failed firms). The following section will consider the reasoning behind the separation of the surviving and failed firms.

5.7.1 Reasoning for Separation of Datasets

The type of the panel of this thesis is a short micro panel since there are few time periods spanning the years 2000 until 2014 (T=15) relative to the large number of surviving firms (N=341) and inactive firms (N=401) (Baltagi, 2013). Panel datasets can be either balanced or unbalanced. The panel dataset(s) of both the surviving and failed firms are unbalanced, meaning that there are no full observations of firms across all the years. In an ideal situation, all the observations would have data for all the years included. However, missing data is inevitable, in which there are some missing values for some observations or firms and the missing values were random according to the datasets from Compustat and CRSP in WRDS.

The reason for having an unbalanced panel (i.e. missing values) is due to randomness and not systematic reasons. The separation of surviving and failed firms and conducting separate analysis in each of the chapters 7 and 8 ensures that there is no attrition bias in the data that would affect the results of this chapter. Thus, the inclusion of both surviving and failed firms in the same dataset would introduce bias, since failed firms would have less number of observations in comparison to surviving firms and this is due to their failure and not randomness.

Fixed effect panel regression analysis was conducted on each of the surviving and failed firms in separate datasets in STATA to exclude panel attrition bias (Cameron & Trivedi, 2010). Furthermore, all firms with missing or zero R&D were excluded from the final dataset. This is because R&D is used to compute innovativeness and if it were to be missing, then it would cause many firms to have missing values for one of the main dimensions of EO. Thereby, such procedures were done to ensure that there is no attrition bias when conducting the regression analysis.

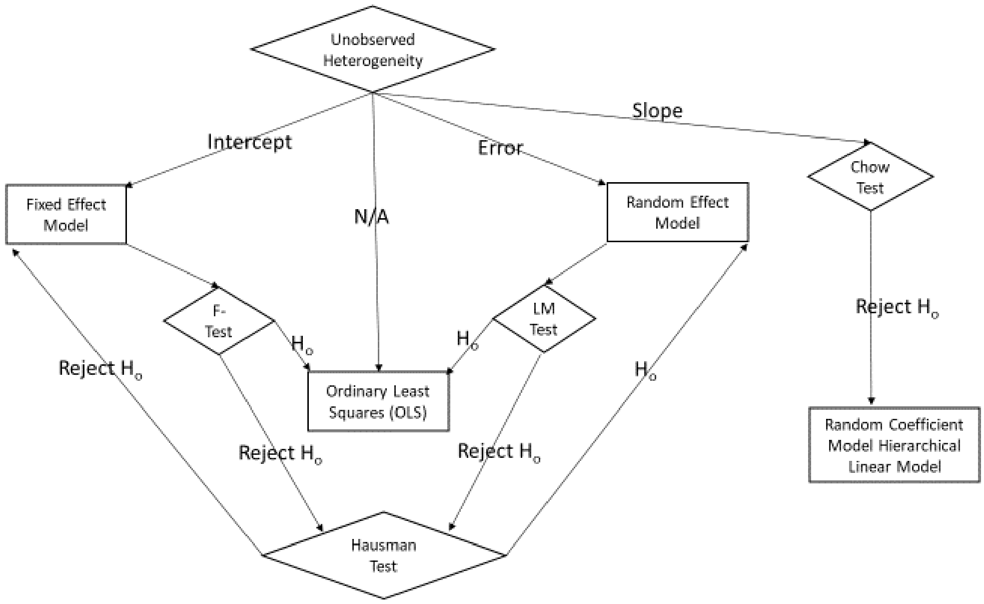
5.8 Chapter Conclusion

In conclusion, the chapter presented the measurement and sources of data of the EO, the control variables, as well as the firm performance variables. The inclusion of the variables was based on the EO-as-Experimentation perspective. This reiterates the deductive strategy, which involves starting with theory and testing for theory. The guidance of this research was based on theoretical grounding (Antonakis & Dietz, 2011). Furthermore, the control variables (investment opportunity, firm age, firm size, liquidity, leverage, and systematic risk) were considered since they affect the EO and firm performance relationship. This research involved the use of secondary data to generate the objective proxies. The use of proxies to reflect the complex constructs of this thesis is in line with the objectivist ontological positioning and the scientific realist epistemological positioning.

The first analysis chapter will describe the results of Study 1. The interpretation of those results and the testing of Study 1 underlying hypotheses was based on organisational learning and prospect theory.

The next chapter will outline the method of Study 2.

Figure 5.1: Panel Data Steps



Source: adopted from Park (2011: 16)

Table 5.1: Study 1 Variables' Definitions and Measurements

	Definition	Measurement	Source and data items
Dependent Variables			
Tobin's Q	Valuation of a firm's market value represented by the ratio of the firm's market value to book value of assets	{(common shares outstanding × calendar year closing price) + (current liabilities–current assets) + long-term debt + liquidating value of preferred stock)}/ by total assets	Compustat: (CSHO*PRCC_C) +(LCT-ACT) +DLTT+PSTKL)/AT
ROA	A profitability accounting-based measure of a firm's financial performance	Net income before extraordinary items /total assets	Compustat: IB/AT
Independent Variables			
EO	The exhibition of firm-level behaviours: Innovativeness, Proactiveness, and Risk taking	Standardised values of the EO dimensions were summed into an EO index	Compustat and CRSP
Innovativeness	Technological experimentation through investing in R&D	1)R&D expenditure divided by the total assets 2) Alternative: Patent yield was measured by the number of patents at application date divided by R&D	1)Compustat: XRD/AT 2)Patent data from Kogan et al. (2012) and Li et al. (2014) (merged with Compustat/CRSP merged file based on CRSP identifier Permno)
Proactiveness	Anticipating future demand and retaining resources to ensure the firm's positioning in the market	Percentage of annual earnings reinvested in the company, which is retained earnings divided by total assets	Compustat: RE/AT
Risk taking	Involves taking bold decisions and actions by venturing into new or emerging markets or by borrowing heavily and being willing to tolerate the uncertainty	Unsystematic risk or the portion of risk that is unattributed or unexplained by the industry	CRSP: Measured as the standard deviation of residuals from the regression of running the daily stock returns on the value weighted market returns
Control Variables			
Firm Age	Listing Age: The age of the firm since it was listed on CRSP	1)Computed as the difference between the observation year in Compustat/CRSP	1)Compustat and CRSP

	Founding age: The age of the firm since it was first founded	merged file and the firm's listing year in CRSP 2)Alternative: Computed as the difference between observation year in Compustat and founding date	2)Loughran and Ritter (2004) data on founding age and company websites
Firm Size	The classification of firm size based on number of employees	Log value of number of employees	Compustat: Log(EMP)
Systematic Risk	Market risk represented by the industry	The value-weighted market returns	CRSP
Leverage	The percentage of total debt from a firm's total assets	Short-term and long-term debt divided by total assets	Compustat: DLC+DLTT/AT
Liquidity	The availability of liquid assets or cash and short-term investments from the firm's total assets	Cash and Short-term investments divided by total assets	Compustat: CHE/AT
Investment Opportunity	Degree to which is spent on long-term assets	Capital expenditures divided by beginning of year long-term assets (equipment, property, and plant)	Compustat: CAPX/Lagged PPENT
Time Dummies		Fiscal year time dummies (dichotomous variables with value zero or 1 for each fiscal year)	Compustat

Chapter 6

Research Methodology for Study 2:

Examining EO and its Dimensions and Firm Failure Relationship

6.1 Introduction to the Chapter

This chapter describes the measurement of the independent variable EO, and the dependent variables, failure rate of firms. The chapter links to the research question: What is the effect of EO and each of its dimensions on the risk of failure/financial distress?

The issue of why some firms fail and others survive has become a fundamental concept in organisational research (Josefy et al., 2017). Firm failure is widely and narrowly viewed as the death or the shutdown of a business (Hughes et al., 2010). This thesis considers firm failure to be more complex than just the shutdown of a business and additionally includes the discontinuity of ownership, liquidation, bankruptcy, and privatisation (Josefy et al., 2017).

Failure is not only limited to represent an outcome, but could also reflect the decisions and strategic activities of the business (Josefy et al., 2017; Revilla et al., 2016). Firm failure is the 'quintessential' factor of firm performance (Josefy et al., 2017). The contributing factor to why some firms fail, while others survive is due to a 'performance threshold' or a minimum performance level, which is firm-specific and is dependent on the firm's characteristics (Gimeno et al., 1997; Wiklund & Shepherd, 2011). Firm failure often results in direct and indirect financial and non-financial costs to various stakeholders involved (Altman, 1968; Revilla et al., 2016). Thus, the interest in prediction models of failure or financial distress has grown especially following major corporate collapses in the global financial crisis. This thesis focuses on the contributing factor EO on the probability of financial distress.

In addition to the accounting and market-based measures of firm performance, firm failure as a dependent variable was also assessed based on the status of the firm in Compustat. The Cox (1972) proportional hazard model was used to empirically assess the effect of the main variables (EO and its separate dimensions) on the probability of failure of the sample of firms. The survival analysis was conducted in SAS since SAS has comprehensive features for conducting survival analysis (Allison, 2010). Hazard models have long been used in the literature to analyse firm failure (Cefis & Marsili, 2005).

In this chapter, it is important to advance Study 1, which focused on the effect of EO on firm performance, by also considering the effect of EO on the risk of firm failure. The significance of this work lies in the disentanglement of the different outcomes of EO ranging from financial and market performance to continuation of ownership and operations (Josefy et al., 2017). In accordance with Wiklund and Shepherd (2011), most of the literature has studied the effect of EO on firm performance only amongst surviving firms (e.g. Rauch et al. 2009). The significance of this thesis is that not only did it examine the EO-firm performance relationship in the sample of surviving firms and failed firms separately, but it also considered the effect of EO on the risk of firm failure in the overall sample of firms. This is relevant, since according to the EO-as-Experimentation perspective, EO results in higher performance variance and leads to higher risk of business failure (Wiklund & Shepherd, 2011). Thus, firms with higher EO levels have more of a likelihood to fail (Wiklund & Shepherd, 2011).

The purpose of this chapter is to outline the Cox proportional hazard regression models that are tested and to outline the assumptions of the regression. Study 2 has been designed to test hypotheses *H*4, *H*5, *H*6c, *H*7c, and *H*8c.

The next section will outline the relevance of conducting survival analysis in this research.

6.2 Data Analysis Methods: Relevance of Conducting Survival Analysis

The purpose of this section is to outline the reason for choosing survival analysis and its appropriateness for the thesis dataset. By conducting survival analysis, then the effect of EO and its dimensions on the risk of firm failure can be examined.

Survival analysis is a statistical method that examines the occurrence of events. This statistical technique has not been adopted in the entrepreneurship literature as much as in industrial economics studies. Previous studies have examined factors, such as firm size and firm age, that affect the survival of firms (Cefis & Marsili, 2005). Recently, in the strategic management literature, it has been noted, that the effect of certain factors on the failure rate of firms differs among firms in different developmental stages (i.e. among new ventures versus mature large and established firms) (Josefy et al., 2017). For instance, although innovation is vital for firm survival among mature firms (Mezias & Mezias, 2000), it was found that innovation also accelerates the rate of failure among new ventures (Hyytinen et al., 2015). Thus, this chapter only focuses on the failure rate in established large firms, which is the main dataset that the thesis utilised.

Survival analysis is appropriate to conduct since such an analytical approach was intended for longitudinal data. The overall thesis was longitudinal in nature with a sample of 742 firms in total from the pre-crisis period (fiscal year 2000) to the post-crisis period (fiscal year 2014) resulting in 5,011 observations. The overall sample of this thesis was a random sample that has been extracted from the Compustat and CRSP merged database. Thus, the sample showed the actual failure rate of high-technology large firms in the specified timeframe. The use of a random sample was better than a matched choice based sample, which equivalates the characteristics of surviving and failed firms, because a matched sample selection introduces a selection bias (LeClere, 2005).

The risk of a firm being in financial distress or of failing is a significant firm outcome. It has not been examined until recently in the entrepreneurship literature (Revilla et al., 2016). Studies have mostly resorted to cross-sectional studies and to relying on short-term metrics or assessments of EO. This thesis uses insights from organisational learning and prospect theory, thus it is of relevance to examine the risks associated with EO and its dimensions on the failure rate of firms.

After outlining the relevance of conducting survival analysis, the next section will consider the advantages of using survival analysis as an analytical tool in this research.

6.3 The Advantage of Survival Analysis

The purpose of this section is to state the advantages of utilising survival analysis in comparison to running a regression analysis.

The main advantage of survival analysis is its ability to handle censored observations since the duration of the following research is limited. Observations are termed censored when there is incomplete information on their survival time. Censoring occurs for different reasons.

The type of censoring in this Study is termed right censoring, the common type of censoring. In the sample there are surviving firms that have survived even after the last year of observation in the thesis (i.e. fiscal year 2014) and that did not experience the event of failure during the allocated timeframe (Josefy et al., 2017). This means that the observations for the surviving firms would be terminated before the occurrence of the event of failure. Thus, these observations must be censored to account for the fact that they did not experience an event of failure in comparison to failed firms. On the other hand, left censoring occurs when a sample of firms experienced the event of failure at the start of the study. Left censoring was not needed in this Study as all the firms in the sample were surviving at the start date (i.e. fiscal year 2000). Survival analysis has an advantage over a linear regression. The latter is biased because it does not account for censoring and does not include a time element. Survival analysis would provide more insight into the failure of firms across time. Thus, survival analysis was used in this Study since it allows us to include the surviving firms in the analysis by accounting for the censoring of their observations. If we chose to adopt a linear logistic regression, then we would not be able to include their observations in the regression. Furthermore, a logistic regression considers the dependent variable as a binary outcome (e.g. Swift, 2016), whereas by using survival analysis we could measure the dependent variable as an interaction between time and the status of the firm.

Treating the outcome of failure as a binary outcome has been scrutinised in the literature (Josefy et al., 2017). One would not be able to measure the risk of failure and its interaction with time by considering firm failure a binary dummy variable (Josefy et al., 2017). Survival analysis, using the Cox proportional hazard model, will be able to measure the probability of failure of a firm in a particular year given that it has survived until that point. Furthermore, survival analysis accounts for time by using the time-series data on the firms to measure their hazard of failure (Campbell et al., 2011).

By utilising survival analysis, this research could examine the effect of the main predictor variables (EO and its dimensions) on the risk of failure (being bankrupt or insolvent, no longer filing with the SEC, or entering a financial distress situation) at a certain point in time across a longitudinal timeframe.

The next section will consider the key functions that are employed in survival analysis.

6.4 The Key Functions in Survival Analysis

The purpose of this section is to outline the two functions (survival and hazard function) used in survival analysis. The focus of the thesis is on the hazard function, which measures the hazard or risk of failure of the main constructs under investigation.

Survival analysis has two key mathematical functions, the survival function and the hazard function (Allison, 2010).

6.4.1 Survival Function

The survival function measures the probability for a failed firm of surviving beyond time (t). This means that it measures the probability of a failed firm experiencing the event at time (T), on the condition that the event time (T) is greater than a given time (t). Thus, the survival function can be written as:
$S(t)=pr(T>t)$ (Equation 1)

6.4.2 The Hazard Function

The hazard function on the other hand measures the probability of failure for a surviving firm within the period. Thus, it measures the risk of firm failure at time (t) of an event that occurs at time (t+1) (Revilla et al., 2016). This means that the event time (T=t+1) is higher than a given time (t). The hazard can be considered as the change in the log of the survival function (Allison, 2010). For this thesis, the hazard function was used since the concern was to measure the effect of EO and its dimensions on the risk of the failure rate of the surviving firms.

In the below equation 2, which represents the hazard function, time (T) is the time of the occurrence of the event of failure for a given firm, whereas (t) represents the time of the firm observation. The hazard function equation measures the risk that the event of failure would occur at time (t) for a firm. Since time is continuous, essentially the equation quantifies the risk in a time interval between time (t) and time (t and Δt), conditional that the firm is still alive at time (t). Thus, the hazard function is also called the hazard rate since it specifies the rate of failure per time unit in the interval of time (t, t and Δt) (Allison, 2010). The only restriction imposed on the hazard rate is that it is non-negative.

The hazard function is defined as:

$$H(t)=\lim_{\Delta t\to 0}\frac{pr(t\leq T<t+\Delta t \mid x(t), T\geq t)}{\Delta t}\geq 0 \text{ (Equation 2)}$$

This section has outlined the survival analysis functions (survival and hazard functions). Since this Study utilises the hazard function, then the next section will consider the hazard regression equation(s).

6.4.3 The Hazard Function Regression Equation(s)

The purpose of this section is to outline the hazard function regression equations, which are derived from the hazard function.

The hazard function depends on a set of covariates. The hazard function indicates how changes in the covariates (e.g. EO and its dimensions) would change the hazard rate. The assumption of the Cox proportional hazard regression is that the hazard is constant over time. This implies that the hazard has an exponential relationship with time as can be shown in the below equation 3 (Allison, 2010).

According to the below equation 3, the hazard for a surviving firm to enter a financial distressed situation at time (t) is the product of the baseline hazard $h_0(t)$ and the linear function of the set of covariates, which are exponentiated. The baseline hazard can be considered as the hazard rate for a firm that has all values of zero for each of the variables. Thus, it is equivalent to the intercept term in a multiple regression equation.

There are two types of variables included in the Cox proportional hazard regression: time-varying and time invariant variables. The hazard function at time (t) for time-varying covariates means that the hazard depends on their values at time (t). The values for the time-varying covariates would be the yearly observations since the data is in a panel form. For time-invariant variables, it means that the hazard depends on their values irrelevant of the time factor. Thus, the proportional hazard regression equation is written as:

$H(t)=h_0(t)\exp(B_1X_{1it}+B_2X_{2i}\ldots.+B_kX_{ik})$ (Equation 3)

The log of the hazard ratio is essentially the hazard function divided by the baseline hazard, which is a linear function of the regressors. Thus, by taking the log of both sides of equation 3, the proportional hazard regression equation can be rewritten as the below equation 4:

$LogH(t)= Logh_0(t)+ B_1X_{1it}+B_2X_{2i}\ldots.+B_kX_{ik}$ (Equation 4)

After outlining the proportional hazard regression equation(s), the next section will present the regression equations 4.1 and 4.2 (in the form of equation 4) including the main variables (predictor and control variables), which are used in this Study.

6.5 The Study's Regression Model(s)

The purpose of this section is to present the proportional hazard regression equations including EO and its dimensions, similar to Study 1.

Equations 4.1 and 4.2 are the proportional hazard regression equations of the Study. In the equation(s), the time-invariant variables with only the suffix of the firm variable (i or gvkey, the firm identifier) are the industry-specific dummy variables for the high-technology industry. The rest of the variables are the time-varying variables. The $logh_0(t)$ is the unspecified arbitrary baseline hazard (LeClere, 2000).

In this chapter, there are two sets of Cox proportional hazard regression equations, in which equation 4.1 examines the EO dimensions as the predictors and equation 4.2 examines the main predictor variable (EO). Most importantly, similar to Study 1, each EO dimension is run in separate regressions to eliminate the effect of multicollinearity among the EO dimensions on the statistical results.

The proportional hazard regression equation(s) of this Study are written as:

Equation 4.1:

$Logh(t)= Logh_0(t)+B_1innovativeness_{gvkey,t}+B_2proactiveness_{gvkey,t}+B_3unsystematic\ risk_{gvkey,t}+B_4systematic\ risk_{gvkey,t}+B_5firm\ size_{gvkey,t}+B_6firm\ age_{gvkey,t}+B_7leverage_{gvkey,t}+B_8organisational\ slack_{gvkey,t}+ B_9Tobin'sQ+ B_{10}IndustryDummies_{gvkey} +B_{11}FinancialCrisis$

Equation 4.2:

$Logh(t)= Logh_0(t)+B_1EO_{gvkey,t}+B_2systematic\ risk_{gvkey,t}+B_3firm\ size_{gvkey,t}+B_4firm\ age_{gvkey,t}+B_5leverage_{gvkey,t}+B_6organisational\ slack_{gvkey,t}+ B_7Tobin'sQ + B_8 IndustryDummies_{gvkey} +B_9FinancialCrisis$

Similar to chapter 5 of Study 1, the next section will present the definition and operationalisation of the dependent variable of the proportional hazard regression equations (4.1 and 4.2) and the computation and reasoning behind the inclusion of the control variables.

6.6 Variables in the Cox Proportional Hazard Regression

The purpose of this section is to outline the variables, dependent and controls, used in the proportional hazard regression equations (4.1 and 4.2), their operationalisation, and the relevance of including the control variables in the regression equations.

6.6.1 Dependent Variable

The dependent variable, the log of the hazard function in the Cox proportional hazard regression equation(s) 4.1 and 4.2, is the interaction between the length of time, from the first year examined until the last firm(s') observation, and the status of the firm(s) (surviving or failed). The scale in which the length of time is measured is the number of months. For surviving firms, the length of time would be the number of months from the start of the time included (fiscal year 2000) until the month of the last observation (i.e. fiscal year 2014). The time to event for failed firms would be the number of months from year 2000 until the month of death, according to the delisting date 'DLDTE' in Compustat. The status of the firms that is used in the Cox proportional hazard regression are the censored firms. Thus, the Cox proportional hazard regression model would estimate the probability that a surviving firm at time (t) would experience the event of failure in the next few time periods included in the timeframe of the thesis.

Firms are delisted in Compustat for several reasons, as classified by 'reason for deletion' variable, which is a two-digit delisting code. The reasons for delisting include merger and acquisition (M&A), bankruptcy, liquidity, and no longer filing with the SEC (privatisation). As outlined in chapter 3, this thesis considers firm failure to encompass discontinuity of ownership (M&A), bankruptcy or liquidity, and privatisation (Josefy et al., 2017). The first classification of failure, which was due to discontinuation of ownership (by mergers or acquisitions), is listed in Compustat as delisting code 01. The second classification of failure, which was due to bankruptcy is listed in Compustat as delisting code 02. The third classification of failure, which was due to discontinuation of operations or asset liquidation is constructed as delisting code 03. Lastly, the last classification was defined as failure due to other reasons, such as no longer having SEC files, and is listed in Compustat as code 09 or 10.

This thesis considered discontinuity of ownership as a type of failure, in which the successful exited firms were separated from the unsuccessful exits by Altman's (1968) Z-score of financial distress. This was done to determine whether a firm that exited due to a merger or acquisition would have went bankrupt had it not been for the merger or acquisition (Josefy et al., 2017; Wiklund & Shepherd, 2011). Altman's Z-score has several firm-level indicators such as firm size, leverage, liquidity, and performance to characterise firms that enter a financial distress situation. The Z-score was computed as such: (earnings before interest and taxes/total assets*3.3) + (sales/total assets*0.99) + (market value of equity/total liabilities*0.6) + (working capital/total assets*1.2) +(retained earnings/total assets*1.4). Firms that had a Z-score less than three had experienced a financial distress situation. As a result, 268 firms were left from 401 firms and were considered as failed.

The next section will outline the control variables that are included in the regression equations (4.1 and 4.2).

6.6.2 Control Variables

This section outlines the control variables that are included in the survival analysis regression equations. The control variables are: performance measures, firm age, firm size, organisational slack, leverage, systematic risk, and the high-technology industry dummies.

6.6.2.1 Performance Variables

The control variable Tobin's Q was included in the regression. Market-based measures of firm performance (Tobin's Q) influence the failure or survival rate of a firm. The more likely that a firm has higher stock returns or profits the less likely it would experience failure. Conversely, if a firm is performing poorly, it is more likely to enter into financial distress (Levinthal, 1991; Opler & Titman, 1994). Thereby, it is expected that a higher Tobin's Q would have a negative effect on firm failure. The computation is similar to that presented in chapter 5, yet it was industry adjusted to compare the performance of each firm with its respective competitors in the same industry. The industry adjusted variable was computed by subtracting the value of Tobin's Q of each firm in each fiscal year from the industry average (using Fama and French (1997) 12 industrial classifications) of the value of Tobin's Q during that fiscal year.

6.6.2.2 Firm age

Firm age was included as a control variable since firm age has been shown to affect the firm's standing. According to the liability of newness and adolescence, the relationship of firm age with the failure rate of a firm is non-linear. This means that young firms with a liability of newness are more likely to suffer from a deficiency in resources and capabilities than older firms (Bruderl & Schussler, 1990). Older firms that exhibit a liability of adolescence also have a higher likelihood of failure due to their inability to adapt to changes in the competitive environment (Thornhill & Amit, 2003). Thereby, it is expected that firm age would have a U-shaped relationship with firm failure. Its computation was similar to that presented in chapter 5.

6.6.2.3 Firm size

Firm size was included as a control variable since firm size has been shown to affect the failure rate of firms (Mellahi & Wilkinson, 2004). According to the liability of smallness, smaller firms are susceptible to be affected by market shocks and don't have the necessary resources to counteract such shocks (Baum & Oliver, 1991; Hannan & Freeman, 1984). Thereby, it is expected that firm size would have a negative effect on firm failure. Its computation was similar to that presented in chapter 5.

6.6.2.4 Organisational Slack

Liquidity in the form of organisational slack, which is the current liquidity ratio, represented by current assets divided by current liabilities, influences the failure rate of a firm. A firm with more liquid assets, that can pay off its short-term debt obligations, is less likely to enter financial distress (Shleifer & Vishny, 1992). This ratio has been shown to affect EO (Hughes et al., 2015). The availability of slack resources seems to enable EO, while their absence might stifle EO (Wiklund & Shepherd, 2005). Covin and Lumpkin (2011) call slack resources innovation-facilitating resources. Thereby, it is expected that liquidity would have a negative effect on firm failure. The liquidity ratio was represented by the ratio of current assets to current liabilities (Chatterjee & Hambrick, 2007) (ACT/LCT). The source was from Compustat.

6.6.2.5 Leverage

Leverage, the ratio of total debt to total assets, is also important to consider as a variable that influences firm survival/failure (Charitou et al., 2004). Financial distressed firms tend to use more leverage than healthy firms as the increasing use of debt would increase the risk of failure (Altman, 1968). Thereby, it is hypothesised that leverage would have a positive relationship with firm failure. Its computation was similar to that presented in chapter 5.

6.6.2.6 Market or Systematic Risk

Systematic risk, which is the market risk, would have a significant positive effect on firm failure. Financial widespread losses, evidenced by the 2007-2009 financial crisis, negatively impacted firm survival (Acharya et al., 2016). Its computation was similar to that presented in chapter 5.

6.6.2.7 High-technology Industry Dummies

The separate high-technology industries are included in the Cox proportional hazard regression excluding one high-technology dummy to avoid the dummy-variable trap (Cameron & Trivedi, 2010). The computation was based on a dichotomous variable with values of either 1 or zero for each high-technology industry.

6.6.2.8 Financial crisis

The financial crisis was accounted for through time dummies coded as 1 for the fiscal years 2007, 2008, and 2009.

The next section will outline the Cox proportional hazard regression assumptions. Similar to the fixed effect regression, the assumptions of the proportional hazard regression must be tested.

6.7 The Proportional Hazard Model Assumptions

The purpose of this section is to outline the proportional hazard regression assumptions, which is the proportionality and the linearity assumption.

6.7.1 Proportionality Assumption

The assumption of the Cox proportional hazard regression model is that the hazard is constant over time. This means that hazard for any firm is a fixed proportion of the hazard of another firm (Cox & Oakes, 1984). Thus, this explains the name of the regression model as the proportional hazard model. In such a model, the ratio of the hazard rates of each of the firms are proportional and independent of time (i.e. do not vary with time). However, the name is misleading as it does allow for nonproportional hazards by including the time interaction with variables that violate such an assumption (Allison, 2010).

To assess the proportionality assumption of the hazard of the time-varying variables, three methods were used. First, graphs based on the Schoenfeld residuals as a function of time were used to visually assess proportionality assumption of the hazard of the time-varying variables (Schoenfeld, 1982). If the slopes of the graphs were shown to be significantly fluctuating from zero, this indicates that the proportionality assumption does not hold (Allison, 2010). Second, the variables were also tested by the proportionality test of the hazard. Third, the variables that were shown to be significant by the proportionality test (i.e. their Schoenfeld residuals were significantly varying from zero) were refitted in the Cox proportional hazard regression model by including their interaction with time (usually in log form). This was done to account for the non-proportionality or dependence of their hazard with time (Allison, 2010; Keele, 2010; Revilla et al., 2016). If the variable-time interaction coefficient was shown to be significant, then it validated that the proportionality assumption was violated (Allison, 2010, Revilla et al., 2016). The third assessment is also the remedy of the violation of the assumption of proportionality of the hazard.

6.7.2 Linearity Testing of the Predictor Variables

The functional form of the variables was tested similar to a fixed effect regression. This was done by the martingale residual scatter plots. The martingale residual was generated from a null model (without the covariates) first and then the regressor variables were plotted against the martingale residual to test their functional form. If the scatterplot is non-linear this is evidence of non-linearity of the variable. It is important to test the functional form of a variable first because a non-linear variable might show as a non-proportional hazard (Keele, 2010).

The functional forms of the variables were assessed, and the non-linear variables were adjusted by adding a squared term onto the Cox proportional hazard regression. The squaring was conducted on the standardised variables.
Similar to Study 1, the presence of extreme observations or outliers would have a significant effect on the statistical results, thereby the variables were winsorized to

their respective 1st and 99th percentiles. Furthermore, each of the variables was standardised (Miller & Le Breton-Miller, 2011).

The next section will outline the assessment of the Cox proportional hazard regression, which involves the model fit statistics and the global test.

6.8 Assessment of the Proportional Hazard Model

The purpose of this section is to outline the assessment of the proportional hazard regression, based on the model fit statistics and the global test. This was done in Chapter 5 of Study 1, in which the fixed effect regression was assessed based on the adjusted R-squared value and the F-test.

Model fit statistics are produced after running the Cox proportional hazard regression(s). The model fit statistics table has measures to assess the model fit (Akaike's information criterion and Schwartz's Bayesian criterion statistics). In this table, such statistics compare the model with no predictors to the model with the predictors and they penalise models with more covariates. The model with the predictors is a better fit if the model fit statistics with the predictors is less than those without the predictors (Allison, 2010). The Cox proportional hazard regressions that were run showed that the model fit statistics were lower among the models with the covariates. This indicates that the model with the variables is a better model than the one without the selected variables.

The global test, which is similar to the F-test in the fixed effect panel regressions, tests the null hypothesis that the coefficients of the variables are all equal to zero. In accordance to the test, if the null hypothesis is rejected, then this indicates that at least one of the covariates included in the Cox proportional hazard regression has an influence on the failure rate of the firms or that one of the coefficients is not zero (Allison, 2010). The global test includes the Wald test, the likelihood ratio test, and the score test. The Wald test is the mostly cited among researchers (e.g. Revilla et al., 2016).

The next section will present the estimation method that is used in the Cox proportional hazard regression.

6.9 Estimation Method of the Proportional Hazard Model

The purpose of this section is to outline the estimation method of the proportional hazard regression model, which is the partial likelihood estimation.

To estimate the hazard function there are parametric and non-parametric methods. The Cox proportional hazard semi-parametric model was chosen. This model utilises the partial likelihood estimation method, (Cox, 1972). The partial likelihood function of the proportional hazard model can be considered as a function that only depends on the Beta coefficients disregarding the baseline hazard. Similar to maximum likelihood estimation, the partial likelihood produces consistent estimates and is asymptotically normal in large sample sizes (Allison, 2010). Thus, the non-parametric part of the Cox proportional hazard regression equation is the baseline hazard probability distribution, which is left unspecified. The advantage of using a Cox proportional hazard regression is that one does not need to make assumptions on how the baseline hazard depends on time (Keele, 2010). This was not of a concern for this Study.

Cox (1972) proposed the partial-likelihood estimation method of the conditional probability of failure of firms, while assuming that there are no tied events. Tied events means that two events occur at the same time. However, there is a possibility that two firms might have experienced the same time of failure. Efron (1977) modified the function to include tied events. The Efron approximation is better than the default Breslow approximation by SAS as the Breslow approximation deteriorates as the number of ties increases (Farewell & Prentice, 1980).

The next section will outline the overview to analysing the proportional hazard regression results.

6.10 Synopsis to the Analysis and Statistics Results

The following section introduces the interpretation of the Cox regression results before the outline of the survival analysis chapter.

The coefficients of the Cox proportional hazard regression were interpreted such that coefficients greater than zero or hazard ratios greater than 1 indicate that the variables increase the risk of firm failure. Conversely, hazard ratios less than 1 indicate that the variable reduces the risk of firm failure. The percentage of the reduction of the risk of failure is computed as (1-hazard ratio). Hazard ratios equal to 1 indicate that the variables have no effect on the failure rate of the sample of surviving firms. The hazard ratios were presented in the tables of the survival analysis chapter in parentheses.

The survival graphs of each of the separate EO dimensions were also presented to compare the survival rate of firms high in the EO dimensions versus the rest of the sample. Even though the Cox proportional hazard regression was used to estimate the effect of each of the EO dimensions on the failure rate of firms, survival curves were also used to preliminary compare survival functions of the different EO dimensions. Survival analysis often initially presents the survival curves through non-parametric methods before outlining the Cox proportional hazard regression results (Wagner & Cockburn, 2010).

Non-parametric methods are desirable because they make no assumptions on the survival or hazard functions. To achieve this, we use the Kaplan Meier product-limit estimates to compare the survival function of firms high in EO/EO dimensions to the overall sample of the Study (Kaplan & Meier, 1958). This was done to test the null hypothesis, which is that the survival functions are the same between the different groups of firms (Allison, 2010; Wagner & Cockburn, 2010).

In the results section, the survival figures show the number of censored surviving firms that are at risk of failure at each period (Allison, 2010). The censored observations are shown in the graphs as plus signs or tick marks. The 95% confidence interval limits around the survivor functions are shown in the graphs to indicate the 95% confidence limits of the probability of survival of the failed firms in the specified time (Allison, 2010). The graphs show the comparison of the survival functions of two groups and the log-rank test was utilised to test the null hypothesis of the difference between two requested groups.

6.11 Chapter Conclusion

The following chapter has shown the reasoning behind conducting survival analysis in addition to the panel regression analysis of the performance effects of EO and each of its dimensions. The proportional hazard regression was used, and its functions and regression equations were outlined in the chapter. Furthermore, the inclusion of the control variables in the proportional hazard regression models was reasoned based on the effects of the variables on the failure rate of firms. The assumptions of the regression as well as its assessment criteria were outlined.

The next chapter will introduce the synopsis to the first two analysis chapters, which are the fixed effect regression results of the effects of EO and each of its dimensions in the sample of surviving firms and failed firms. The following will present the results of the fixed effect regression in the sample of the surviving followed by the failed firms. Lastly, chapter 9 will present the results of the survival analysis.

Table 6.1: Study 2 Variables' Definitions and Measurements

	Definition	Measurement	Source
Dependent Variables			
Failure	Failed firms: M&A, Bankruptcy, Liquidity, and no longer filing with SEC	Coded as 1 for failed firms that faced a financial distress based on the Z-score	Compustat/CRSP merged file
Independent Variables			
EO	Refer to Study 1		
Innovativeness	Refer to Study 1		
Proactiveness	Proactiveness was industry adjusted to assess the percentage of profits reinvested in the firm in each year in comparison to rivals in the same industry (Miller & Le Breton-Miller, 2011).		
Risk taking	Refer to Study 1		
Control Variables			
Firm Age	Refer to Study 1		
Firm Size	Refer to Study 1		
Systematic Risk	Refer to Study 1		
Tobin's Q	Industry adjusted Tobin's Q		
Leverage	Refer to Study 1		
Organisational Slack	Current liquidity ratio	Current assets/Current Liabilities	Compustat: ACT/LCT
High-technology Dummies		Coded as 1 for each high-technology dummy (dichotomous variable)	Compustat
Financial Crisis Dummy		Coded as 1 for fiscal year 2007 2008 and 2009	Compustat

Synopsis to Chapters 7 and 8

S.1 Synopsis to Analysis Chapter 7 and 8

The following represents a synopsis to the analysis chapters of the panel fixed effect regressions on each of the surviving and failed firms. This section covers a comparison of the mean values, along with the standard deviations, of the main variables EO and its dimensions (innovativeness, proactiveness, and risk taking) among surviving and failed firms in the different high-technology industries included.

The following section presents results on the testing of the first hypothesis of this thesis outlined in chapter 3, which states:

H1: Failed firms are more entrepreneurially oriented in comparison to surviving firms.

Table S.1: Mean Values and Standard deviations in each High-technology Industry among Surviving and Failed Firms

	EO		Innovativeness		Proactiveness		Risk taking	
Industry	**Active Firms**	**Failed Firms**	**Active Firms**	**Failed Firms**	**Active Firms**	**Failed Firms**	**Active Firms**	**Failed Firms**
Computer Hardware	0.59 (1.27)	1.33 (1.48)	0.09 (0.06)	0.11 (0.07)	-0.09 (0.7)	-0.28 (0.95)	0.03 (0.02)	0.04 (0.02)
Electronics	0.57 (1.22)	1.04 (1.55)	0.1 (0.08)	0.12 (0.11)	-0.24 (2.44)	-0.47 (1.58)	0.03 (0.01)	0.03 (0.01)
Software	0.43 (1.36)	0.8 (2.76)	0.1 (0.08)	0.12 (0.09)	-0.22 (1.47)	-0.94 (3.95)	0.02 (0.01)	0.04 (0.02)
Communication Services	-0.39 (1.08)	-0.41 (1.49)	0.04 (0.07)	0.01 (0.02)	-0.26 (0.58)	-1.14 (1.36)	0.03 (0.02)	0.04 (0.02)
Communication Equipment	-0.38 (3.35)	0.82 (1.15)	0.08 (0.05)	0.09 (0.06)	-1.24 (5.47)	-0.17 (0.91)	0.03 (0.01)	0.03 (0.01)
Telephone Equipment	-0.56 (1.31)	0.54 (1.66)	0.03 (0.05)	0.04 (0.04)	-0.34 (0.79)	-1.49 (1.88)	0.03 (0.02)	0.06 (0.04)
Navigation Equipment	-0.66 (0.77)	0.18 (1.93)	0.04 (0.03)	0.05 (0.09)	0.3 (0.26)	0.13 (0.41)	0.02 (0.01)	0.03 (0.02)
Measuring and Controlling Devices	0.18 (0.86)	0.5 (1.11)	0.08 (0.05)	0.09 (0.05)	0.21 (0.52)	0.12 (0.47)	0.02 (0.01)	0.03 (0.01)
Medical Instruments	-0.17 (0.71)	0.35 (1.05)	0.07 (0.05)	0.08 (0.04)	0.11 (0.67)	-0.02 (0.85)	0.02 (0.01)	0.03 (0.02)
Overall Mean	0.2669	0.804	0.086	0.105	-0.093	-0.434	0.025	0.033

Note: Standard deviations in parentheses

The above table presents a comparison of the mean values of EO and its dimensions among surviving and failed firms in the specific high-technology industries.

Among the surviving firms, the highest EO value (mean value of 0.59) was exhibited among firms in the computer hardware industry followed by firms that belong to the electronics industry and the software industry. As for the EO dimensions, innovativeness was highest (mean value of 0.1) in the firms belonging to the electronics and software industries. Proactiveness was highest (mean value of 0.3) among firms that belong to the navigation equipment industry followed by measuring and controlling devices and medical instruments. Lastly, risk taking was generally the same among the industries with either a mean value of 0.02 or 0.03.

Among failed firms, the highest value of EO (mean value of 1.33) was among the computer hardware industry, followed by the electronics industry (mean value of 1.04), and the communication equipment industry (mean value of 0.82). Innovativeness was highest (mean value of 0.12) among the firms that belong to the electronics and software industries. Proactiveness was highest with a mean value of 0.13 among firms that belong to the navigation equipment industry, followed by measuring and controlling devices with a mean value of 0.12. Lastly, risk taking was generally the same with either a mean value of 0.03 or 0.04.

Failed firms exhibited higher values of EO (highest mean value of 1.33) in comparison to the surviving firms (highest mean value of 0.59). This supported the above hypothesis (*H1*) of the thesis.

Among the high-technology industries, there were higher mean values of EO among the failed firms, except for the communication services industry. Furthermore, innovativeness was higher among the failed firms' high-technology industries, except for communication services industry. In the case of proactiveness, it was higher among the surviving firms' high-technology industries except for the communication and navigation equipment industries. Lastly, risk taking was higher among the failed firms' high-technology industries except for the communication equipment and electronics industries, in which the surviving and failed firms belonging to such industries exhibited the same mean values of risk taking.

On average failed firms were more innovative, with an overall mean value of 0.105, and more risk taking, with an overall mean value of 0.033, and less proactive, with an overall mean value of -0.43, in comparison to the surviving firms, which had an overall mean innovativeness value of 0.086, overall mean value of proactiveness of the value -0.093, and overall mean value of risk taking dimension of EO of the value of 0.025. The overall mean value of EO was higher among the sample of the failed firms, in which the overall mean value of EO among the sample of firms was 0.8 among failed firms and 0.26 among surviving firms. If the separate mean values of each of the EO dimensions were not examined, then one would assume that the sample of failed firms had higher values for each of the EO dimensions reflecting the higher overall value of the EO construct. Yet, these independent results for each of the EO dimensions aligned with the multi-dimensional conceptualisation of EO (Lumpkin & Dess, 1996).

The next chapter 7 will outline the panel fixed effect regression results among the surviving firms, followed by chapter 8, which will outline the regression results among the failed firms.

Chapter 7

The Relationship of EO and Firm Performance among Surviving Firms

7.1 Introduction to the Chapter

The main purpose of this chapter is to present the effects of each of the EO dimensions and the overall effect of the EO construct on firm performance (market based represented by Tobin's Q as well as an accounting measure represented by short-term firm performance or ROA) among surviving firms. Thus, this chapter is detailing only the results from the surviving firms' dataset. The same procedure outlined in this chapter will be conducted on the failed firms in chapter 8. For the purpose of this study, a sample of 341 surviving high-technology firms from fiscal year 2000 until 2014 was selected with a total of 3,148 observations. Secondary measures of each of the main and control variables were developed. The surviving firms were identified based upon the Compustat code for surviving firms.

The sequence of the chapter is as follows: the descriptive statistics of the variables, the pre-analytical procedure of testing the panel fixed effect regression assumptions, time-series figures of the main dependent and predictor variables, the panel fixed effect regression results, different EO values effects on firm performance, and finally the robustness checks sequentially. As such, the first required step before outlining the results from the regressions was to test the assumptions of the panel fixed effect regression to indicate whether the panel fixed effect regression was appropriate.

In the methodological chapter 5 of Study 1, each of the dependent variables and regressors that were included were based upon their effect on firm performance and the EO-firm performance relationship according to the EO-as-Experimentation perspective. The effects of each of the EO dimensions/overall EO construct on the firm performance measures were empirically tested. STATA software was used to run the panel regressions on the EO dimensions as predictor variables and firm performance measures as the predicted variables. This chapter aims to answer the below hypotheses. The hypotheses, outlined in the theoretical chapter 3, that were tested in this chapter are:

7.1.1 Hypotheses: EO Construct and Firm Performance

H2: The relationship between EO and (a) short-term and (b) long-term firm performance among surviving firms is an inverted U-shaped relationship.

7.1.2 Hypotheses: EO Dimensions and Firm Performance

H6a: Innovativeness has a negative effect on short-term firm performance (ROA).
H6b: Innovativeness has a positive effect on long-term firm performance (Tobin's Q).
H7a: Proactiveness has a positive effect on short-term firm performance (ROA).
H7b: Proactiveness has a negative effect on long-term firm performance (Tobin's Q).
H8a: Risk taking has an inverse U-shaped effect on short-term firm performance (ROA).
H8b: Risk taking has a negative effect on long-term firm performance (Tobin's Q).

The next section will outline the descriptive statistics of the predictor and the dependent variables.

7.2 Descriptive Statistics for Predictor and Dependent Variables among Surviving Firms

The following section outlines the descriptive statistics for each of the variables that are included in this Study. The statistics include the mean, standard deviation, minimum and maximum levels, and the skewness and kurtosis.

The first table 7.1 presents the statistics for the predictor variables and the second table 7.2 presents the statistics for the dependent variables.

Table 7.1: Descriptive Statistics for the Predictor Variables

Predictor Variables (winsorized)	**Mean**	**S.D.**	**Min**	**Max**	**Skewness**	**Kurtosis**
EO	0.2669	1.583	-21.773	8.674	-4.638	59.556
Innovativeness (R&D intensity or R&D divided by total assets)	0.086	0.0614	0.0032	0.293	1.0207	3.8407
Innovativeness (R&D divided by total number of employees)	0.037	0.036	0.0004	0.177	1.63	5.85
Innovativeness (patent yield or number of patents divided by R&D)	0.386	0.424	0.0087	2.243	2.224	8.676
Proactiveness	-0.0932	1.04	-6.668	1.133	-1.670	6.202
Risk taking	0.025	0.012	0.0079	0.072	1.374	5.285
Systematic Risk	1.323	0.548	0.155	3.0037	0.681	3.515
Investment opportunity	0.339	0.251	0.045	1.444	1.9	7.5
Firm size (number of employees)	9285.23	18948.61	517	117300	0.7609	2.899
Firm age Listed	17.592	13.482	0	59	-0.073	3.438
Firm age Founded	33.78	25.39	3	182	0.315	3.04
Leverage	0.143	0.154	0	0.623	1.002	3.275
Liquidity	0.272	0 .175	0.0083	0.726	0.552	2.598

Table 7.2: Descriptive Statistics for the Dependent Variables

Dependent Variables (winsorized)	**Mean**	**Standard Deviation**	**Min**	**Max**	**Skewness**	**Kurtosis**
Tobin's Q	1.728	1.472	0.0083	7.989	1.927	7.321
ROA	0.0216	0.136	-0.649	0.2687	-2.336	10.944

Tables 7.1 and 7.2 represent the values of the variables when winsorized by changing the outliers to the respective variables' 1st and 99th percentile (Miller & Le Breton-Miller, 2011), yet for the panel regressions all the variables were standardised as well (Engelen et al., 2015). The values of the standardised variables were not presented in these tables since the standardised variables have a mean of zero and standard deviation of 1.

The skewness and kurtosis of the variables are also outlined in the tables. Skewness (which is a measure of symmetry) indicates how well the data is symmetrical and kurtosis (which is a measure of the tailedness of the distribution) is a measure of whether the data is heavy tailed or light tailed in comparison to a normal distribution. In the case of the predictor variables, firm size, firm age, that were logged in the regressions, the skewness and kurtosis values were of the logged variables. The variables that were of a wide range were log transformed (i.e. firm size and firm age) when running regressions with each of Tobin's and ROA, as the dependent variables.

In the table of the predictor variables 7.1, as previously outlined in chapter 5, EO is the sum of the standardised values of its dimensions. The average value of the main measure of innovativeness (R&D/total assets) in the sample of firms was 0.086, which indicates that the firms are being innovative around 8.6 %. The alternative mean value of innovativeness based on patent yield was 0.38. The mean value of proactiveness, proxied by retained earnings divided by total assets since proactiveness is a forward-looking behaviour, was -9 %, which indicates that on average the surviving firms in the sample have accumulated deficit during the period of the Study (fiscal year 2000 till 2014). The average value for risks (which was calculated as the standard deviation of the residuals of the daily stock returns on the value weighted market returns) was 0.025.

As for the control variables, the systematic risk or value weighted market return in the sample of firms on average was 1.32. The alternative value of systematic risk which is the standard deviation of the regression used to predict unsystematic risk was not used due to a high correlation with the unsystematic risk dimension of EO (Hoberg & Parabhala, 2009).

Investment opportunity on average (represented by capital expenditures divided by long term assets) was 33.9 % in the sample of firms. The firm size indicated that on average firms have about 9,285 employees. The firm age on average was 17.6 years keeping in mind that the firm age resembles the time when the firm was first listed. Also, the lowest value of firm age was zero because such firms were listed either during or after the first year of interest in the Study (i.e. fiscal year 2000). The firm age based on the founding date of the firms on average was 33.7 years, with the lowest being 3 years. Most importantly, when firm age based on founding date was used in the main regression results, the results did not change. Leverage, which is total debt divided by total assets, for the sample of firms on average was 0.14 or 14 % (less than 50%) meaning that less than half of the firms' assets were financed by debt. Liquidity or cash holding ratio, measuring the portion of assets represented in cash, had a mean of 27.2 % in the sample of firms.

In the table of the dependent variables 7.2, the average value of the ratio of market value to book value of assets or Tobin's Q in the sample of firms was 1.72. A ratio of Tobin's Q higher than 1 indicates that the market value of the firm is more than the replacement cost of the firm's assets. Finally, the ROA mean value in the sample of firms was 2.1 %. ROA indicates how profitable firms are relative to their total assets and the higher the ratio, the more desirable it is for firms since it indicates that they are utilising their asset base efficiently. Thus, a ratio of 2.1 % is considered to be relatively low.

Normally distributed variables have a skewness ranging from -1.96 to 1.96 and kurtosis ranging from -3 to 3 (Gurjarti, 2003; Wooldridge, 2015). Most of the variables were within the skewness range except for EO. As for the kurtosis, most of them were slightly above the range except for EO and proactiveness indicating that their distribution was heavy-tailed. The panel fixed effect regression model consistently estimates the variables without having the normality of the variables with a large N (number of observations) and a fixed T (small time in comparison to the number of observations) (Wooldridge, 2015). However, as previously stated what is more important is not the distribution of the variables or the data, but of the residuals, yet even the distribution of the residuals is not an essential assumption of the panel fixed effect regression (Wooldridge, 2015). Thus, addressing issues of multicollinearity, autocorrelation, and heteroscedasticity is more of a necessity because they would affect the regression results (Lumley et al., 2002).

The next section 7.3 will outline the pre-analysis procedure of the appropriateness of the panel fixed effect regression through the F-test, Breusch-Pagan LM-test (Langrange Multiplier), and the Hausman tests. Then the linearity, multicollinearity, heteroscedasticity, and autocorrelation tests are presented.

7.3 Pre-analysis Procedure among Surviving Firms

The following section represents a pre-analysis procedure before running the fixed effect regressions. First, we tested the appropriateness of the fixed effect regression. The next step was to test the assumptions of the fixed effect regression if the fixed effect regression was shown to be appropriate.

7.3.1 Testing for the Appropriateness of the Fixed Effect Regression

The pre-analysis procedure is essential to conduct before running the regression analysis to test the assumptions of the panel fixed effect regression. Since there are separate regressions (ROA or Tobin's Q, EO/EO dimensions), the panel fixed effect regression assumptions should be tested separately on the four regression equations, which are Tobin's Q /ROA as the dependent variables and the main EO dimensions/overall EO construct as the predictor variables.

The panel fixed effect regression appropriateness was determined through the F-test, Breusch-Pagan LM-test, and the Hausman tests sequentially starting with the F-test (refer to figure 5.1 in chapter 5). The testing of the regression assumptions is in accordance with Wooldridge (2015), in which the tests of the panel fixed effect regression involve linearity, multicollinearity, heteroscedasticity, autocorrelation and normality of the residuals.

Table 7.3: F-test of the Regression Models

Regressions	F-test	Probability
Tobin's Q and EO	F (291, 2205) = 12.69	Prob>F= 0
Tobin's Q and EO Dimensions	F (291, 2203) =12.06	Prob>F= 0
ROA and EO	F (291, 2208) =6.21	Prob>F= 0
ROA and EO Dimensions	F (291, 2206) = 3.04	Prob>F= 0

The F-test examines whether a panel fixed effect regression is more appropriate than a simple pooled OLS regression, which ignores the panel structure of the data. As shown in table 7.3 above, the null hypothesis that the panel fixed effect regression coefficients are equal to zero was rejected in each of the four regressions, thereby indicating that a panel fixed effect regression is more appropriate. Furthermore, the F-test examines the overall significance of the regression and this is important rather than just assessing the regression based on the R-squared (Wooldridge, 2015).

The next step was to test whether a panel random effect regression is more appropriate than a pooled OLS regression through the LM-test. The difference between the panel random and fixed effect regression, is that the random effect regression considers that the variation among the firm-year observations are random and that the unobserved firm heterogeneity is uncorrelated with the explanatory variables. However, the fixed effect regression allows for correlations between the unobserved fixed firm-level variables and the explanatory variables, in which the fixed effect regression would control for fixed variables over time (Wooldridge, 2015).

The next section will outline the LM-test of the four regressions of this Study.

Table 7.4: Breusch-Pagan LM-test of the Regression Models

Regressions	**LM-test**	**Probability**
Tobin's Q and EO	Chibar2(01) = 2287.64	Prob>chibar2= 0
Tobin's Q and EO Dimensions	Chibar2(01) = 1995.47	Prob>chibar2= 0
ROA and EO	Chibar2(01) = 623.76	Prob>chibar2= 0
ROA and EO Dimensions	Chibar2(01) = 150.2	Prob>chibar2= 0

As a result of running the Breusch-Pagan LM-test (Langrange Multiplier), as shown in table 7.4 above, the null hypothesis was rejected in the four regressions. The rejection of the null hypothesis indicates that the panel random effect regression is more appropriate than the pooled OLS regression (Park, 2011).

As a summary of applying both tests rigorously, it was shown that a panel fixed effect regression was better than a pooled OLS by the F-test and that a panel random effect regression was better than the pooled OLS by the LM-test. After the results showed that the pooled OLS was rejected, then the choice fell into either a panel fixed effect or a random effect regression, which was tested by the Hausman test. Thus, the next section will outline the Hausman test results.

Table 7.5: Hausman Test of the Regression Models

Regressions	**Hausman test**	**Probability**
Tobin’s Q and EO	Chi2(7) = 77.04	Prob>chi2= 0
Tobin’s Q and EO Dimensions	Chi2(9)= 117.79	Prob>chi2= 0
ROA and EO	Chi2(7) = 137.39	Prob>chi2= 0
ROA and EO Dimensions	Chi2(9) =80.18	Prob>chi2= 0

In STATA, a fixed effect regression was first instructed, and the results were stored in the STATA software. Similarly, a random effect regression was instructed, and the results were stored. Afterwards a Hausman test was conducted to indicate which regression is more appropriate (Cameron & Trivedi, 2010).

According to the results of the Hausman test, as shown in table 7.5 above, the null hypothesis was rejected meaning that a fixed effect regression is more appropriate and consistent (Wooldridge, 2015).

The Hausman test considers that the random effects estimator is fully efficient. Yet, there can be violations to this assumption in the presence of autocorrelation and cross-sectional dependence (Cameron & Trivedi, 2010). Thereby, the next section will outline the results of a robust Hausman test, which was conducted after running a random effect regression with clustered robust standard errors.

Table 7.6: Robust Hausman Test of the Regression Models

Regressions	Robust Hausman test	Probability
Tobin's Q and EO	Chi2(7) = 70.052	Prob>chi2= 0
Tobin's Q and EO Dimensions	Chi2(9) = 111.239	Prob>chi2= 0
ROA and EO	Chi2(7) = 144.29	Prob>chi2= 0
ROA and EO Dimensions	Chi2(9) = 44.112	Prob>chi2= 0

The robust Hausman test, as outlined in table 7.6 above, showed that the null hypothesis was rejected in the four regressions reiterating that the fixed effect is more appropriate than the random effect regression (Cameron & Trivedi, 2010; Wooldridge, 2002).

The next section will outline the testing of the assumptions of the fixed effect regression after it was shown that it was appropriate.

7.3.2 Testing the Assumptions of the Fixed Effect Regression

The following section represents the testing of the fixed effect regression assumptions starting with the linearity, multicollinearity, heteroscedasticity, autocorrelation, and normality testing.

7.3.2.1 Linearity Testing

After the robust version of the Hausman test showed that a fixed effect regression was appropriate, then the next step was to test the assumptions of a fixed effect regression. The first test to conduct was the linearity assumption of the regression, then the multicollinearity testing, followed by heteroscedasticity and autocorrelation tests.

The linearity testing of the four regressions was done separately, in which the results of the Tobin's Q as the dependent variable regressions will be outlined first. Then the results of ROA as the dependent variable regression models will follow.

The first regression to be tested in each of the regressions (of Tobin's Q and ROA as the dependent variables) was the regression of the control variables, then the regression of EO as the predictor variable, and finally the regression with the EO dimensions as the regressors.

The linearity testing was run after each regression on the individual regressors. The linearity testing was also accompanied by scatterplots of the residuals of the regression against the tested predictor variables to validate the linearity test and have a visual representation of the residuals of the regression against the predictor variables.

Below the linearity testing of the regression of Tobin's Q, as the dependent variable, against the control variables will be outlined first.

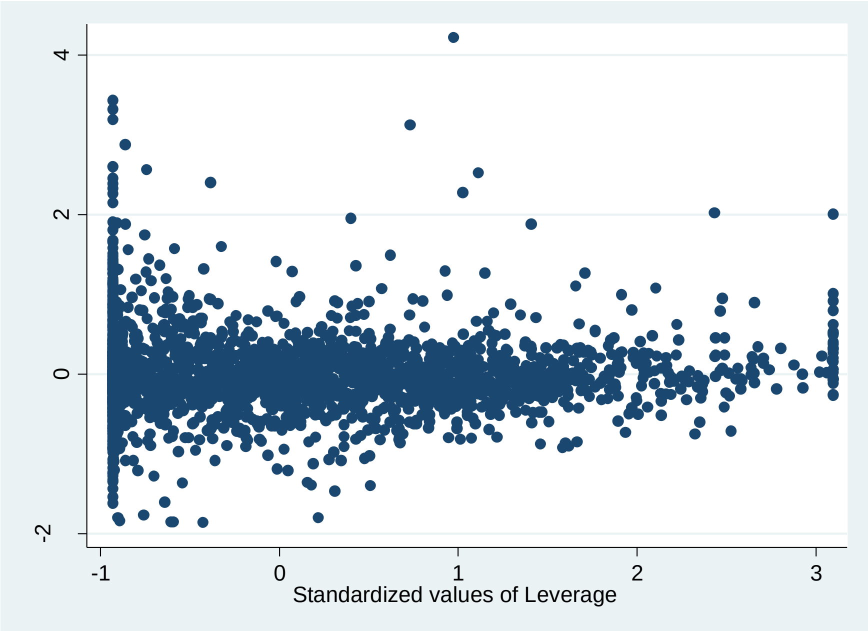
7.3.2.1.1 Linearity Testing of the Regression of Tobin's Q and ROA and the Control Variables

The following section represents the linearity testing of the control variables in the regression of Tobin's Q and ROA as the dependent variables. The regression containing the control variables was run and the linearity test results were obtained. The scatterplots of the residuals against the tested predictor variables were run as well. The beginning of this section will outline the results from the regression of Tobin's Q as the dependent variable followed by ROA as the dependent variable.

Table 7.7: Linearity Test of the Regression of Tobin's Q and Control variables

Control Variables	**Linearity Test**
Systematic Risk	Prob>F= 0.213
Investment opportunity	Prob>F= 0.186
Firm size (logged)	Prob>F= 0.355
Firm age (logged)	Prob>F= 0.4001
Leverage	Prob>F=0.0009
Liquidity	Prob>F=0.858

Figure 7.1: Residual Figure of Tobin's Q and Leverage



The above table 7.7 shows the linearity test of the control variables with Tobin's Q as the dependent variable. As can be shown in table 7.7, the linearity test of the control variables (except for leverage (p-value=0.0009)) were insignificant, which indicates that they have a linear relationship with Tobin's Q since they did not reject the null hypothesis of linearity.

Yet, according to the scatterplot of the residuals of the regression against leverage as shown in figure 7.1 above, the relationship between Tobin's Q and leverage was fairly linear, in which the residuals seemed to be centered around zero (Tarling, 2008).

The next section represents the linearity test of the control variables in the regression of ROA as the dependent variable.

Table 7.8: Linearity Test of the Regression of ROA and Control variables

Control Variables	**Linearity Test**
Systematic Risk	Prob>F= 0.383
Investment opportunity	Prob>F= 0.0007
Investment opportunity (logged)	Prob > F = 0.29
Firm size (logged)	Prob>F= 0.037
Firm age (logged)	Prob>F= 0.447
Leverage	Prob>F=0.102
Liquidity	Prob>F=0.824

Figure 7.2: Residual Figure of ROA and Firm size

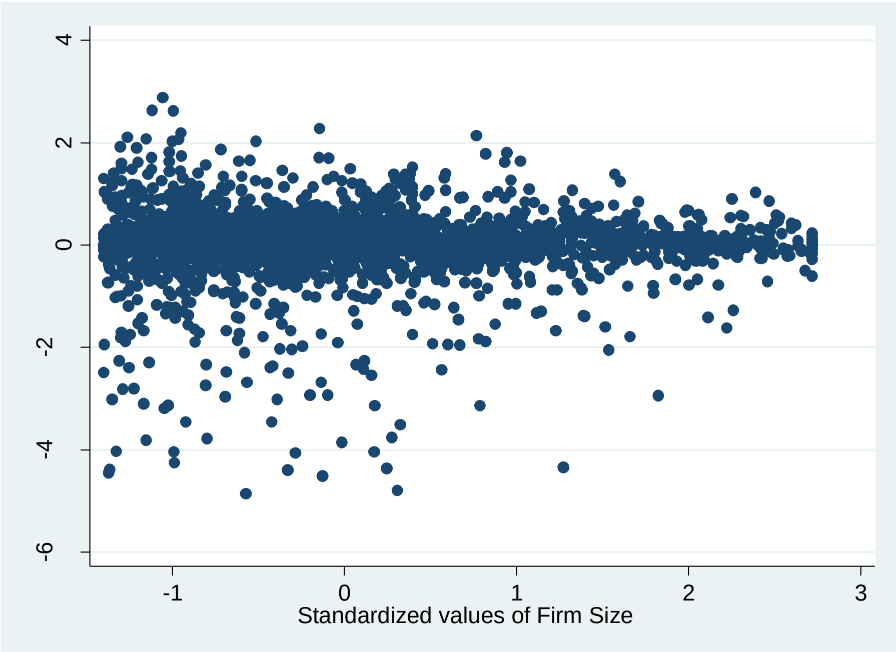


Figure 7.3: Residual Figure of ROA and Investment Opportunity

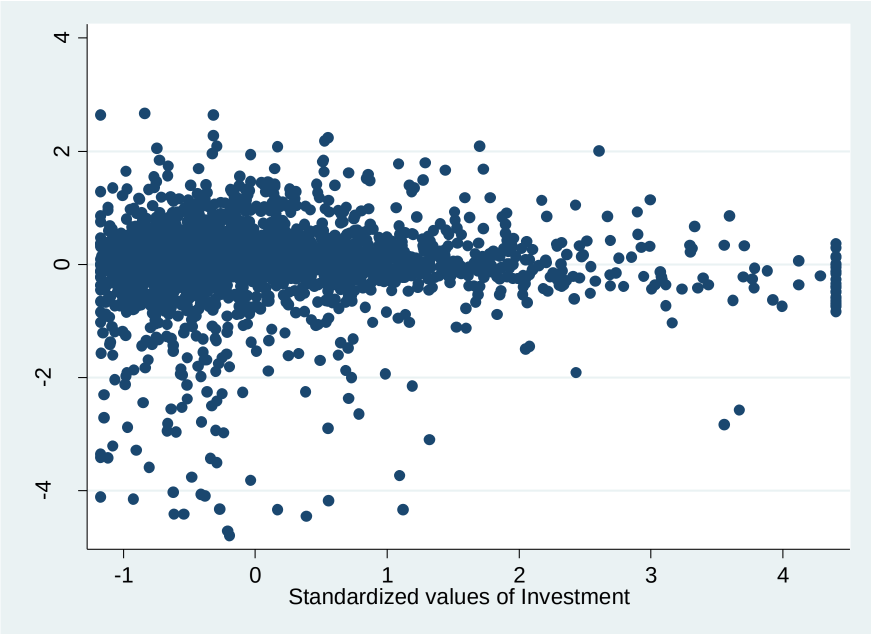
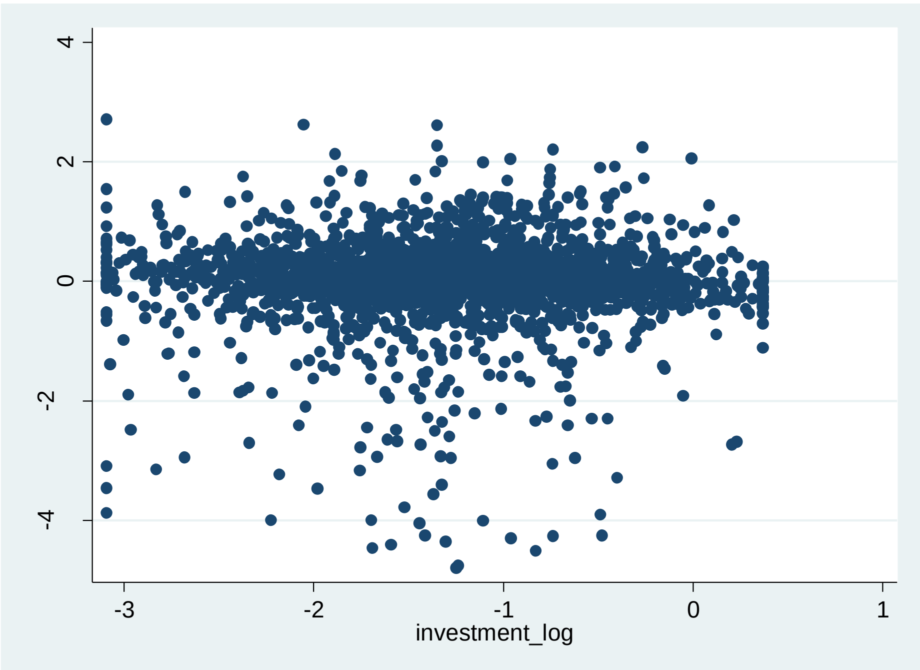


Figure 7.4: Residual Figure of ROA and Logged value of Investment Opportunity



The linearity test of the regression of ROA, as the dependent variable, with the control variables as outlined in table 7.8 above showed that the control variables had a linear relationship with ROA except for firm size (p-value=0.037<0.05) and investment opportunity (p-value=0.0007<0.05). Yet, the relationship between ROA and firm size was linear as can be revealed in figure 7.2. Lastly, according to the residual scatterplot figure 7.3 of the residuals against investment opportunity, it showed non-linearity in the shape of an inverse U-shaped relationship. However, for this Study it was not of a concern to add a squared term of a control variable onto the regression. Accordingly, in the regression with ROA as the dependent variable, investment opportunity was log transformed. After the log transformation, it passed the linearity test (p=0.29). As can be shown in figure 7.4, the linear relationship between ROA and investment opportunity improved after the log transformation of investment opportunity.

The next section will outline the linearity test of the regression of EO, as the independent variable, with each of Tobin's Q and ROA, as the dependent variables.

7.3.2.1.2 Linearity Testing of the Regressions of Tobin's Q and ROA and the EO Construct

The following section shows the linearity test of the EO construct, as the predictor variable, in each of the regressions of Tobin's Q and ROA, as the dependent variables. The section will first outline the linearity test of the EO construct followed by a graphic representation of the relationship of EO with the dependent variable Tobin's Q represented by table 7.9 and figure 7.5. Similarly, the linearity test of the EO construct will be done in the regression of ROA as the dependent variable represented by table 7.10 and figure 7.6.

Table 7.9: Linearity Test of the Regression of Tobin's Q and EO

Regression of Tobin's Q and EO	
Linearity test	Prob > F=0.013
U-test to test the presence of an Inverse U-shaped (H0=monotone)	P>|t|=0.0013
Extreme point	-7.595
Interval	{-21.773, 8.674}
Slope	{0.1214, 8.674}
t-value	{3.019, -3.3907}
Prob>│t│	{0.0013, 0.00039}
90% Fieller interval for extreme point	{-12.1808, -3.422}

Figure 7.5 of the Two-way Function of the Regression of Tobin's and EO

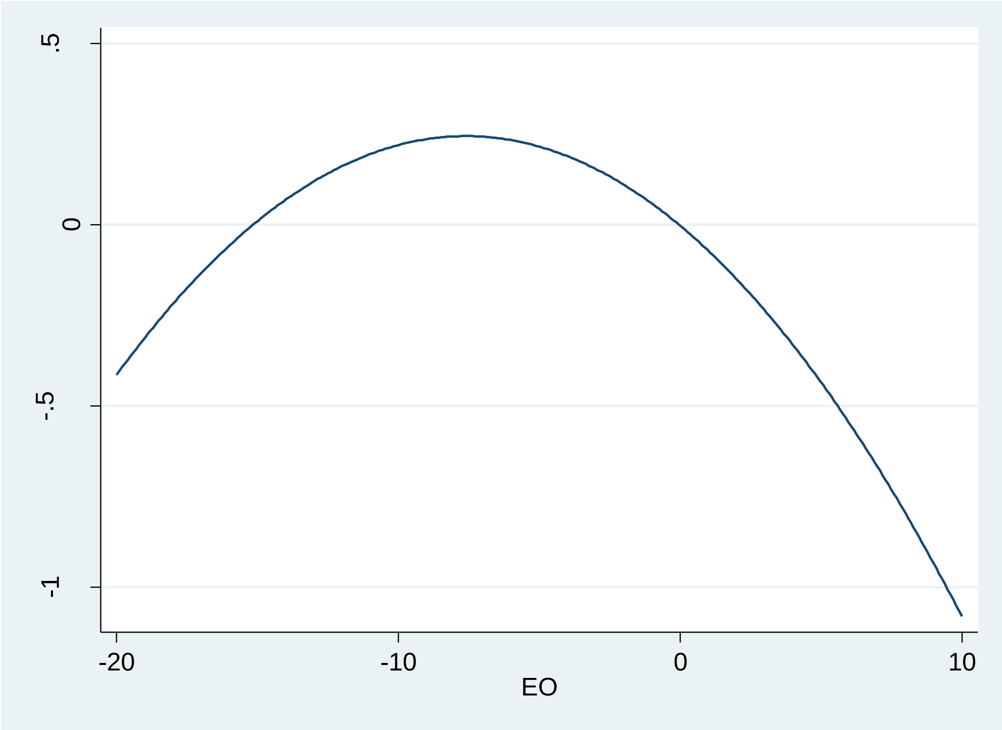
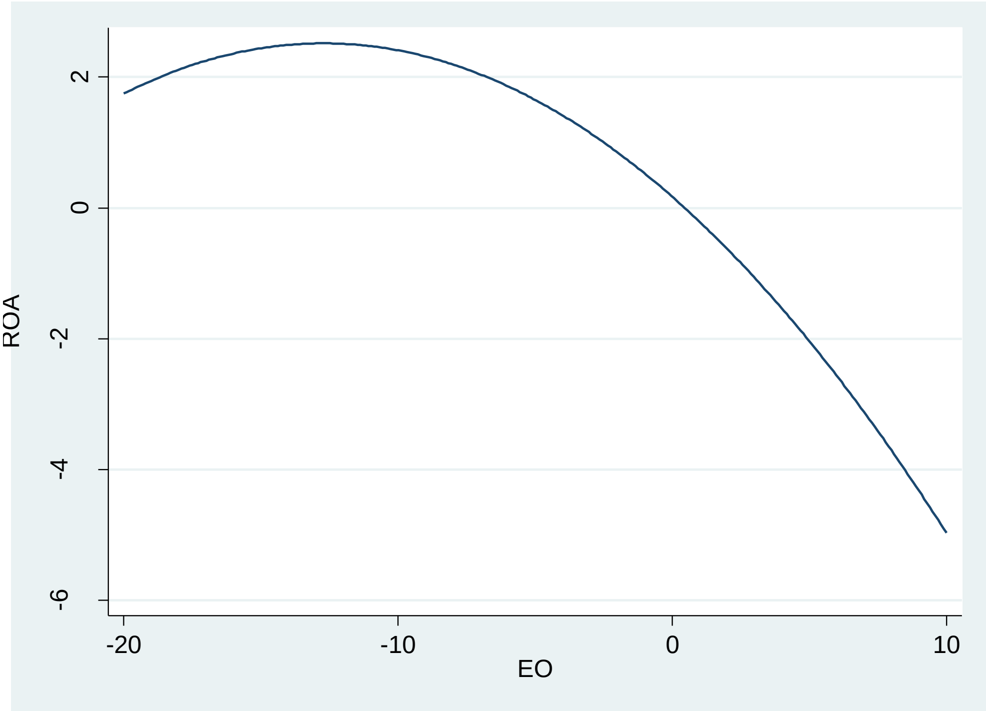


Table 7.10: Linearity Test of the Regression of ROA and EO

Regression of ROA and EO	
Linearity test	Prob>F= 0.016
U-test to test the presence of an Inverse U-shaped (H0=monotone)	Prob>│t│=0.0048
Extreme point	-12.873
Interval	{-21.773, 8.674}
Slope	{0.262, -0.635}
t-value	{2.609, -10.674}
Prob>│t│	{0.0048, $5.78e^{-23}$}
90% Fieller interval for extreme point	{-17.43, -10.027}

Figure 7.6 of the Two-way Function of the Regression of ROA and EO



When running the regression equations of EO with the control variables against Tobin's Q as well as ROA as the dependent variables, EO rejected the null hypothesis of linearity, as can be shown in tables 7.9 and 7.10 above. Thereby, the next step was to test whether EO had a quadratic relationship with each of Tobin's Q and ROA. The squaring was conducted on the standardised variable. The test of identifying a U-shaped relationship or an inverse U-shaped relationship was done after introducing a quadratic term of EO into the regression. The test indicated that EO had an inverse U-shaped relationship with each of Tobin's Q and ROA since it rejected the null hypothesis of a monotone relationship. Also, to validate that it was an inverse U-shaped relationship, the slope at the lower bound was positive and significant at the 1 % level, whereas the slope at the upper bound was negative and significant at the 1% level.

Furthermore, the extremum point (the maximum point in an inverse U-shaped relationship) was within the Fieller 90 percent confidence interval, which provides the robust cut-off points for the rejection of the null hypothesis in the presence of non-normality (Haans et al., 2016; Lind & Mehlum, 2010). Thereby, the regression equation(s) above, when EO is the predictor variable, would be modified to include a quadratic term of EO as well.

The U-test in tables 7.9 and 7.10 and the figures 7.5 and 7.6 showed the relationship between ROA/ Tobin's Q, as the dependent variables and EO, as the independent variable, to be an inverse U-shaped relationship (Hamilton, 2012). Thereby, this validates hypothesis *H2a and H2b*, on the effect of EO on short-term and long-term performance among surviving firms.

The next steps were to test the linearity assumption in the regressions of Tobin's Q/ROA, as the dependent variables, and the EO dimensions, as the predictor variables. The next table will outline the linearity testing results of the regression of Tobin's Q and the EO dimensions.

7.3.2.1.3 Linearity Testing of the Regressions of Tobin's Q and ROA and the EO Dimensions

The following section shows the linearity test of the EO dimensions, as the predictor variables, in the regression of Tobin's Q, as the dependent variable.

Table 7.11: Linearity Test of the Regression of Tobin's Q and EO Dimensions

EO Dimensions	**Linearity Test**	**U-test to test the presence of a U shaped (H0=monotone)**
Innovativeness	Prob > F= 0.448	N.A.
Proactiveness	Prob > F= 0.003	Prob> │t│= 0.108
Risk taking	Prob>F=0.601	N.A.

Each of the EO dimensions with the control variables were run in regressions against Tobin's Q and then were tested for the linearity assumption, as can be shown in the table 7.11 above. The EO dimensions innovativeness (p=0.448) and risk taking (p=0.601) were found to have a linear relationship with Tobin's Q. Proactiveness, on the other hand, had a non-linear relationship with Tobin's Q (p=0.003).

According to the U-test, the relationship of proactiveness with the dependent variable Tobin's Q was not quadratic, in which proactiveness failed to reject the null hypothesis of a monotonic relationship. Thus, this indicates that the relationship between proactiveness and Tobin's Q is monotonic. Thereby, proactiveness was transformed by a logarithmic transformation in the regressions with Tobin's Q as the dependent variables. However, since proactiveness had negative values it was log transformed by an alternative equation that preserved the sign of proactiveness: sign(proactiveness) * log (absolute value(proactiveness) + 1). After the log transformation, proactiveness passed the linearity test.

The next section shows the linearity test of the EO dimensions, as the predictor variables, in the regression of ROA as the dependent variable.

Table 7.12: Linearity Test of the Regression of ROA and the EO Dimensions

EO Dimensions	**Linearity Test**	**U-test to test the presence of a U shaped (H0=monotone)**
Innovativeness	Prob > F= 0.106	N.A.
Proactiveness	Prob > F= 0.014	Extremum outside interval- trivial to reject H0
Risk taking	Prob > F= 0.0	Extremum outside interval - trivial failure to reject H0

Figure 7.7 of the Relationship of ROA and Risk Taking

Each of the EO dimensions with the control variables were run in regressions against ROA, as the dependent variable, and then were tested for the linearity assumption, as can be shown in the tables 7.12 above. In table 7.12, the EO dimension innovativeness (p=0.106) was found to have a linear relationship with ROA. Proactiveness, on the other hand, showed to have a non-linear relationship with ROA (p=0.014).

According to the U-test, the relationship of proactiveness with ROA was not quadratic, in which the extremum point of proactiveness (the maximum point in an inverse U-shaped relationship or the minimum point in a U-shaped relationship) was outside the data range of proactiveness. Thus, this indicates that the relationship between proactiveness and ROA is monotonic. This is the case even though the squared term of proactiveness was significant at the 5% level. Thereby, proactiveness was transformed by a logarithmic transformation similar to the regression of Tobin's Q as the dependent variable. After the log transformation, proactiveness passed the linearity test.

Table 7.12 also outlines the results of the regression of ROA with risk taking. The linearity testing of the risk taking dimension of EO showed that it has a non-linear relationship with ROA. Yet, according to the U-test the relationship between ROA and risk taking, the extremum point was outside the interval.

The figure 7.7 confirms that the relationship between risk taking and ROA was not linear, in which there seemed to be a decreasing concave relationship in the residual plot, and the residuals were not centered around zero.

This provides support for hypothesis *H8a*, as the relationship between risk taking and ROA was shown not to be linear.

When running the regression equation of the dependent variable ROA and risk taking dimension of EO as the main predictor variable, the regression equation was altered to only include the squared term of risk taking. The squaring was conducted on the standardised variable. After including the squared term, the squared term of risk taking passed the linearity test. The next section will outline the multicollinearity testing of the regressions.

7.3.2.2 Multicollinearity Testing

The following section represents multicollinearity testing of the predictor variables through the variance inflation factor (VIF) and the correlation coefficients of the predictor variables in each of the regressions.

7.3.2.2.1 Multicollinearity Test through VIF

This section will test multicollinearity through the VIF values in each of the regressions. The beginning of this section will outline the VIF values in the regression of Tobin's Q, as the dependent variable followed by the regression of ROA, as the dependent variable.

Table 7.13: Variance Inflation Factor of the Regression of Tobin's Q and EO

Variables	VIF	1/VIF
EO	1.75	0.57
EO squared	1.64	0.609
Firm size	1.37	0.731
Firm age	1.27	0.787
Liquidity	1.23	0.815
Leverage	1.15	0.869
Systematic risk	1.13	0.887
Investment opportunity	1.09	0.917
Mean VIF	1.33	

According to the table 7.13 above, there are no issues of multicollinearity as the VIF for each of the explanatory variables was less than 10 and the tolerance value (1/VIF) for the variables was above 0.1 (Wooldridge, 2015). The highest VIF value for EO was 1.75 and the mean VIF was 1.33. Furthermore, the lowest tolerance value was 0.57.

Table 7.14: Variance Inflation Factor of the Regression of Tobin's Q and EO Dimensions

Variables	VIF	1/VIF
Risk taking	1.59	0.628
Firm size	1.45	0.687
Proactiveness	1.41	0.707
Firm age	1.37	0.727
Innovativeness	1.34	0.745
Liquidity	1.32	0.759
Systematic risk	1.26	0.794
Leverage	1.23	0.813
Investment opportunity	1.09	0.913
Mean VIF	1.34	

Concerning the regressions of Tobin's Q, as the dependent variable, and the EO dimensions, as the independent variables, in table 7.14 above, the highest VIF was for risk taking dimension of EO which was 1.59 and the mean VIF was 1.34. Furthermore, the lowest tolerance value was 0.63. Thereby, there are no issues of multicollinearity.

Table 7.15: Variance Inflation Factor of the Regression of ROA and EO

Variables	VIF	1/VIF
EO	1.75	0.57
EO squared	1.64	0.608
Firm size	1.37	0.732
Firm age	1.26	0.792
Liquidity	1.22	0.816
Leverage	1.15	0.867
Systematic risk	1.13	0.887
Investment opportunity	1.06	0.939
Mean VIF	1.32	

According to table 7.15 above, when running the regression of ROA, as the dependent variable, against EO as the predictor variable, the highest VIF was for EO which was 1.75 and the mean VIF was 1.32. Furthermore, the lowest tolerance value was 0.57, which is above 0.1. Thus, there are no issues of multicollinearity.

Table 7.16: Variance Inflation Factor of the Regression of ROA and EO Dimensions

Variables	VIF	1/VIF
Proactiveness	1.36	0.735
Firm size	1.35	0.739
Innovativeness	1.34	0.744
Firm age	1.32	0.756
Liquidity	1.30	0.768
Leverage	1.23	0.813
Systematic risk	1.16	0.864
Risk taking	1.13	0.881
Investment opportunity	1.08	0.921
Mean VIF	1.25	

For the regression of ROA, as the dependent variable, and the EO dimensions, as the independent variables, as shown in table 7.16 above, the highest VIF was for the proactiveness dimension of EO, which was 1.36 and the mean VIF was 1.25. Thereby, this indicated that there are no problems of multicollinearity in each of the four regressions.

In the next section, multicollinearity was also tested by the regressions' correlation coefficients. If the correlation coefficient between two regressors was higher than 0.8, then multicollinearity would potentially be an issue (Gujarati, 2003). The sequence of the multicollinearity testing was done on the regression of Tobin's Q, as the dependent variable, and EO and its dimensions as the predictor variables, followed by ROA, as the dependent variable, and EO and its dimensions, as the independent variables.

7.3.2.2.2 Multicollinearity Testing through Correlation Matrix

The following section represents the multicollinearity testing through the correlation coefficients in each of the regressions of Tobin's Q and ROA as the dependent variables and the EO/EO dimensions as the predictor variables. The correlation of the estimated coefficients of each of the regressions, and not the variables themselves were generated as a result of the variance co-variance matrix. The p values were not included because the vce, corr command used to generate the correlation coefficients in STATA does not produce p-values.

Table 7.17: Correlation Matrix of the Coefficients of the Regression of Tobin's Q and EO

Variables	EO	$EO^{\wedge 2}$	SysRisk	FirmSize	FirmAge	Investment	Liquidity	Leverage
EO	1							
$EO^{\wedge 2}$	0.612	1						
Sys risk	0.173	0.078	1					
Firm size	-0.024	0.101	0.0048	1				
Firm age	0.281	0.033	0.074	-0.446	1			
Investment	-0.158	-0.1509	-0.206	-0.292	0.085	1		
Liquidity	0.344	0.132	0.018	-0.077	0.203	0.1205	1	
Leverage	-0.057	-0.063	-0.107	0.054	0.028	-0.03	-0.191	1

Note: systematic risk was abbreviated as 'SysRisk'

Table 7.18: Correlation Matrix of the Coefficients of the Regression of Tobin's Q and EO Dimensions

Variables	Innov	Risk	Proac	SysRisk	FirmSize	FirmAge	Investment	Liquidity	Leverage
Innov	1								
Risk	-0.084	1							
Proac	0.628	0.187	1						
SysRisk	0.169	0.082	0.055	1					
FirmSize	-0.198	0.043	-0.235	-0.029	1				
FirmAge	-0.051	0.388	0.0906	0.012	-0.382	1			
Investment	-0.148	-0.165	-0.146	-0.155	-0.258	0.103	1		
Liquidity	0.261	0.025	0.2204	0.026	-0.136	0.122	0.0503	1	
Leverage	0.293	-0.074	0.214	-0.0513	0.018	-0.0013	-0.026	-0.052	1

Note: innovativeness was abbreviated as 'innov', proactiveness as 'proac', and risk taking as 'risk', systematic risk as 'SysRisk'

Table 7.19: Correlation Matrix of the Coefficients of the Regression of ROA and EO

Variables	EO	$EO^{\wedge 2}$	SysRisk	FirmSize	FirmAge	Investment	Liquidity	Leverage
EO	1							
$EO^{\wedge 2}$	0.235	1						
SysRisk	-0.144	-0.159	1					
FirmSize	-0.027	-0.233	-0.025	1				
FirmAge	0.311	0.271	-0.131	-0.451	1			
Investment	0.278	0.334	-0.155	-0.028	0.29	1		
Liquidity	0.316	-0.009	-0.194	0.188	0.182	0.193	1	
Leverage	0.053	0.055	-0.132	-0.099	0.171	0.186	-0.126	1

Note: systematic risk was abbreviated as 'SysRisk'

Table 7.20: Correlation Matrix of the Coefficients of the Regression of ROA and EO Dimensions

Variables	$Risk^{\wedge 2}$	Innov	Proac	SysRisk	FirmSize	FirmAge	Investment	Liquidity	Leverage
$Risk^{\wedge 2}$	1								
Innov	-0.179	1							
Proac	-0.018	0.256	1						
Sys risk	0.066	-0.021	0.0004	1					
FirmSize	-0.0981	-0.103	-0.149	-0.176	1				
FirmAge	0.174	-0.061	0.007	0.024	-0.448	1			
Investment	0.189	0.078	-0.128	-0.085	-0.073	0.295	1		
Liquidity	0.062	0.141	0.311	-0.127	-0.039	0.193	0.066	1	
Leverage	-0.214	0.416	-0.134	-0.117	0.022	0.044	0.134	-0.133	1

Note: innovativeness was abbreviated as 'innov', proactiveness as 'proac', and risk taking as 'risk', systematic risk as 'SysRisk'

In table 7.17, the highest correlation of running the regression of Tobin's Q, as the dependent variable, and EO, as the independent variable, was between firm size and firm age being -0.45 (the correlation between EO and the squared value of EO is 0.61, which is expected between a variable and its squared term, yet it is less than 0.8).

The highest correlation, as shown in table 7.18, after running the regression of Tobin's Q, as the dependent variable, and the EO dimensions, was between proactiveness and innovativeness, the two main dimensions of EO, which was 0.6. Thereby, it is important to run separate regressions for each of the EO dimensions. Furthermore, the second highest correlation was between risk taking and firm age being 0.39.

In table 7.19, the highest correlation of running the regression of ROA, as the dependent variable, and EO was between firm size and firm age being -0.45, similar to the regression of Tobin's Q and EO. The second highest correlation was between investment opportunity and the squared term of EO being 0.33.

Lastly, in table 7.20, the highest correlation of running the regression of ROA, as the dependent variable, and the EO dimensions, as the predictor variables, was between firm size and firm age being -0.45. The second highest correlation was between innovativeness and leverage being 0.41. Thereby, this indicates that there were no issues of multicollinearity between the regression coefficients in each of the four regressions.

The next section will outline the heteroscedasticity testing of the regression models.

7.3.2.3 Heteroscedasticity Testing

The next step was to test for heteroscedasticity after multicollinearity testing (Wooldridge, 2015). To test for heteroscedasticity in the fixed effect regressions, the modified Wald test was run after each of the four panel regressions as shown below. The assumption of the fixed effect regression was that the residuals (unobserved errors) have a constant variance. If they did not have a constant variance, this indicates that heteroscedasticity is present.

Table 7.21: Heteroscedasticity Tests of the Regression Models

Regressions	**Heteroscedasticity tests**	**Probability**
Tobin's Q and EO	Chi2(292) =1.2e+35	Prob>chi2= 0
Tobin's Q and EO Dimensions	Chi2(292) =7.1e+35	Prob>chi2= 0
ROA and EO	Chi2(292) =3.3e+35	Prob>chi2= 0
ROA and EO Dimensions	Chi2(292) =1.1e+34	Prob>chi2= 0

The test rejected the null hypothesis of homoscedasticity or constant variance of the idiosyncratic errors in each of the four regressions of EO/EO dimensions, as the independent variables, and Tobin's Q/ROA, as the dependent variables, as shown in table 7.21 above. Thus, this is a clear indication that heteroscedasticity was present and to remedy the biased OLS standard errors, robust and clustered errors were requested by the variance estimator (Cameron & Trivedi, 2010).

The next section will outline autocorrelation testing of the regression models.

7.3.2.4 Autocorrelation Testing

After heteroscedasticity was tested, the next step was to test for autocorrelation or cross-sectional dependence of the error term in each of the regressions (Wooldridge, 2015). The assumption of the fixed effect regression is that the there is no cross-sectional dependence. This section will present the autocorrelation test in each of the regression models.

Table 7.22: Autocorrelation Tests of the Regression Models

Regressions	**Autocorrelation tests**	**Probability**
Tobin's Q and EO	F(1, 237) = 50.365	Prob>F= 0
Tobin's Q and EO Dimensions	F(1, 237) = 45.762	Prob>F= 0
ROA and EO	F(1, 237) = 25.624	Prob>F= 0
ROA and EO Dimensions	F(1, 237) = 89.881	Prob>F= 0

It is shown that the null hypothesis was rejected in each of the regressions in table 7.22 above. To solve for the issue of autocorrelation of the error term, adjustment should be made by requesting robust clustered errors (Baltagi, 2013; Cameron & Trivedi, 2010). Thus, clustering at the firm level was done to account for the autocorrelation among the firms and this ensures the fitness or goodness of the regression.

The last assumption to be tested is the normality assumption, which is achieved through the kernel density graphs of the residual distribution.

7.3.2.5 Normality Testing of the Regressions

The following section represents the normality testing through the kernel density graph of the residuals.

This was done for each of the regressions as will be shown below in figures 7.8,7.9,7.10, and 7.11 below. Firstly, the fixed effect regression was run and then the residuals were generated, but only instructing the idiosyncratic error, which refers to the true residual or error component (Baum, 2006). Consequently, the kernel density graphic representation of the distribution of the residuals was derived. The figures compare the distribution of the residuals to a normal distribution.

Figure 7.8: Normality Test of the Regression of Tobin's Q and EO

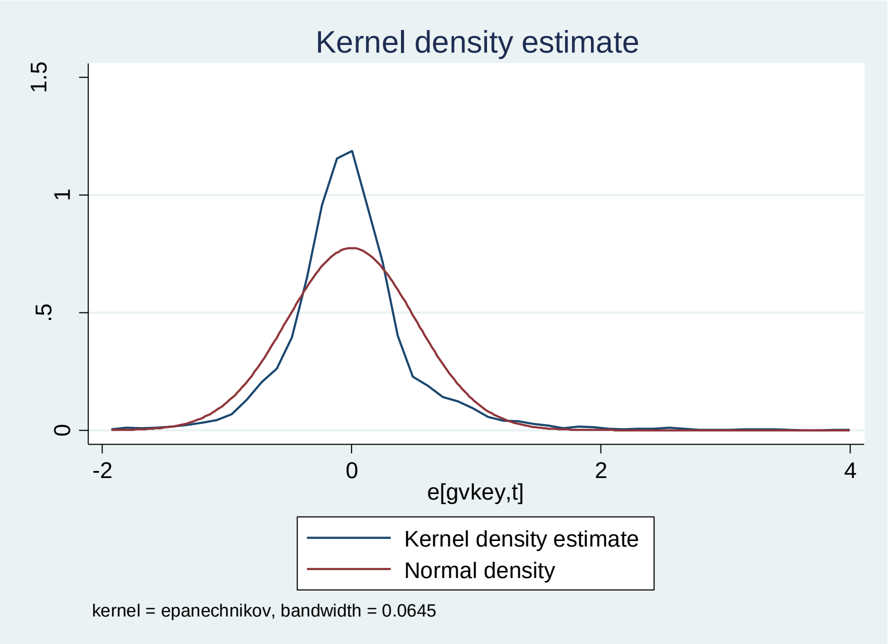


Figure 7.9: Normality Test of the Regression of Tobin's Q and EO Dimensions

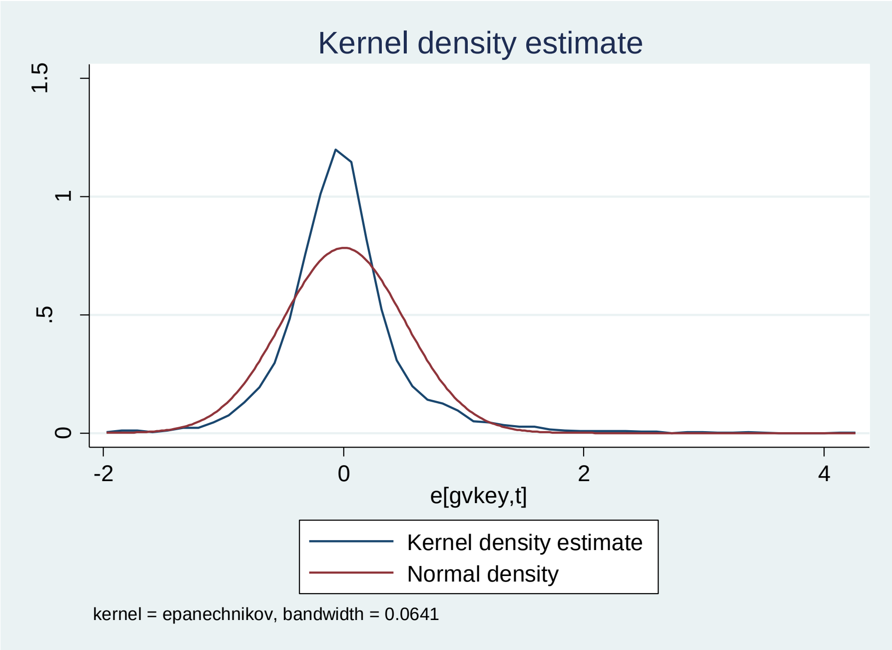


Figure 7.10: Normality Test of the Regression of ROA and EO

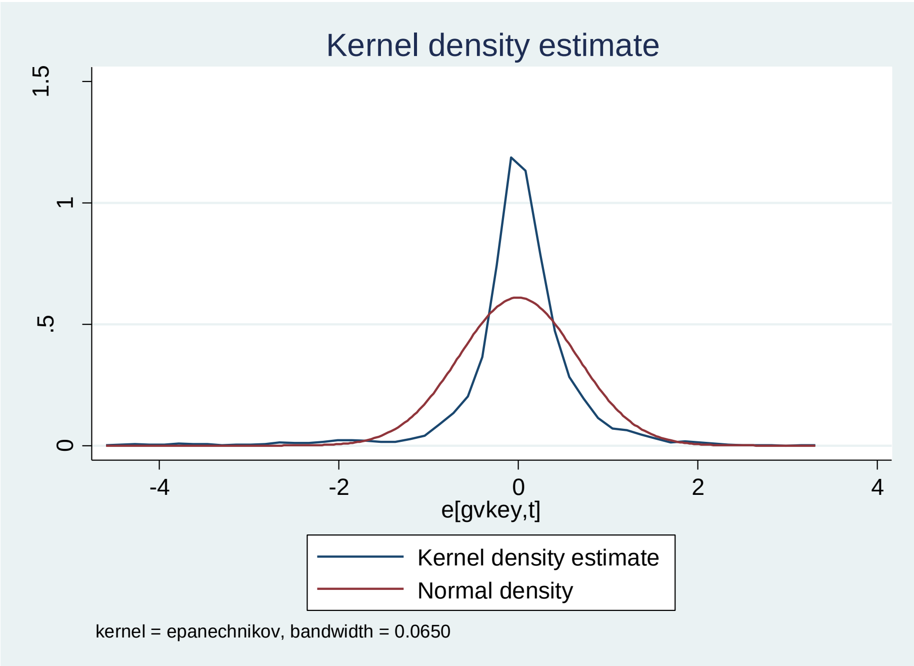
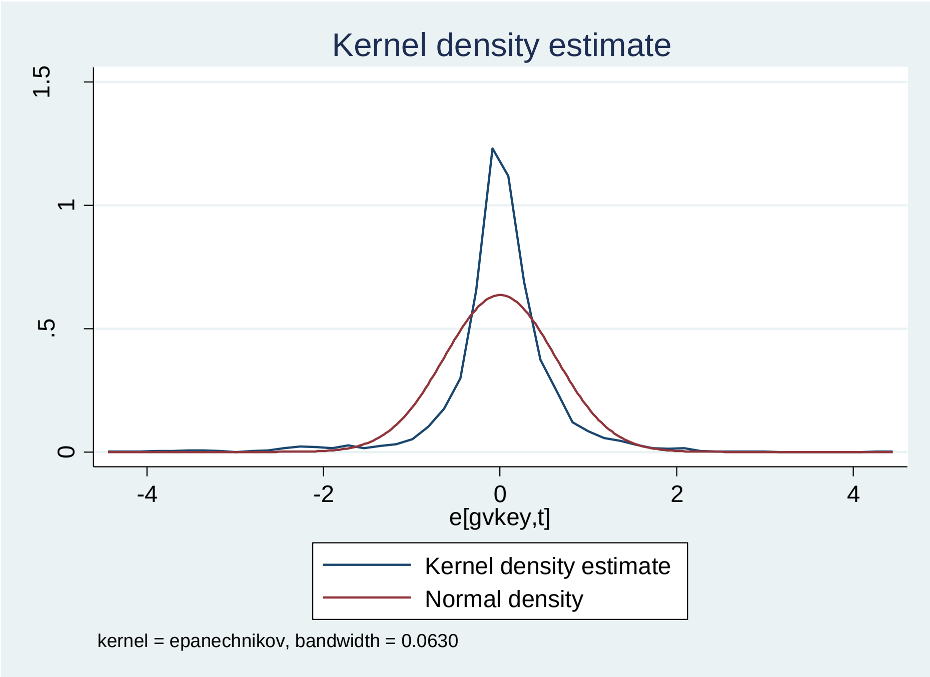


Figure 7.11: Normality Test of the Regression of ROA and EO Dimensions



The figures of the residual distributions above are fairly symmetrical (no major issue of skewness). There was not much of a major departure from the normal distribution curve, however there was moderately high kurtosis. The figures indicate that the normality assumption was not fulfilled. Yet, when there were a lot of observations, non-normality became trivial and from the regression one could rely on asymptotic inference (Omre & Amagata, 2006).

According to central limit theorem, one can rely on asymptotic inference when there is a relatively high number of observations. In a panel setting with many observations and a large sample size, normality is not as essential as issues of multicollinearity, heteroscedasticity, and autocorrelation in the fixed effect regression.

There are 3,148 observations and a sample of 341 surviving firms. Thereby, in accordance with central limit theorem, the assumption of normality of the residuals (deviation of the observed or actual values from predicted or fitted values) of an OLS regression became trivial in comparison to issues such as heteroscedasticity and multicollinearity, which would then affect the coefficient estimates and hence affect the statistical inference (Lumley et al., 2002).

As the sample size increases, a matter more pressing than normality should be addressed, which is the presence of outliers. Thereby, all the variables (predictor and dependent) were winsorized by converting the variable's outliers to the variable's 1st or 99th percentile, respectively (Miller & Le Breton-Miller, 2011) so that the white noise or volatility in residuals was reduced. The shape of the distribution of the residuals improved as a result of the winsorization.

The skewness and kurtosis of the variables improved after winsorization as well. For instance, the kurtosis value of proactiveness improved from a value of 149.08 to 20.9 after winsorization. Furthermore, the skewness and the kurtosis of each of the variables after the log transformations was enhanced, for instance the kurtosis value for the winsorized proactiveness variable, which was 20.9 improved to a value of 6.2 after the log transformation. Furthermore, in the regression in which ROA was the dependent variable, investment opportunity was logged, in which its kurtosis value improved from a value of 7.5 to a value of 2.94 as a result of being logged.

Lastly, after winsorization, all the variables were standardised as well to ensure comparability of the effects of the predictors on the outcome variables. Standardisation involves transforming the data into z scores by subtracting each variable from the mean and dividing by the standard deviation (Wooldridge, 2015). Standardising the variables would remove multicollinearity problems and ensure that the coefficients are more interpretable. Furthermore, the data should be standardised as the STATA panel regressions do not provide the standardised Beta coefficients.

Most importantly, bootstrapping, which provides valid estimations of the regression coefficients in presence of non-normality of the residuals, was conducted by instructing 500 bootstraps based on cluster of firms and showed that the results of the regression were consistent (Alejo et al., 2015).

According to the F-test, LM-test, and the Hausman tests, the fixed effect was shown to be appropriate. Then, the assumptions of the fixed effect regression were tested. The next step will outline the results of time effect test, in which the significance of the time dummies is tested in the regressions.

7.4 Test of the Time Effect among Surviving Firms

The following section outlines the test of the significance of the time dummies in each of the regressions. If the probability of the test of the time effect is significant, then this indicates that time dummies are necessary to include in the regression.

Table 7.23: Time Effect Test of the Regression Models

Regressions	**F-test**	**Probability**
Tobin's Q and EO	F(12, 291) = 31.58	Prob>chi2= 0
Tobin's Q and EO Dimensions	F(12, 291) = 29.35	Prob>chi2= 0
ROA and EO	F(12, 291) = 3.16	Prob>chi2= 0.0003
ROA and EO Dimensions	F(12, 291) = 6.01	Prob>chi2= 0

According to the results as shown in table 7.23, the null hypothesis was rejected in the four regressions. Thereby, time dummies should be included in the fixed effect regression excluding one-time dummy to avoid the 'dummy-variable trap' (t-1 dummies) (Cameron & Trivedi, 2010). Thus, the fixed effect estimator would be a two-way fixed estimator accounting for both fixed firm and time effects as shown in the regression equation(s) earlier.

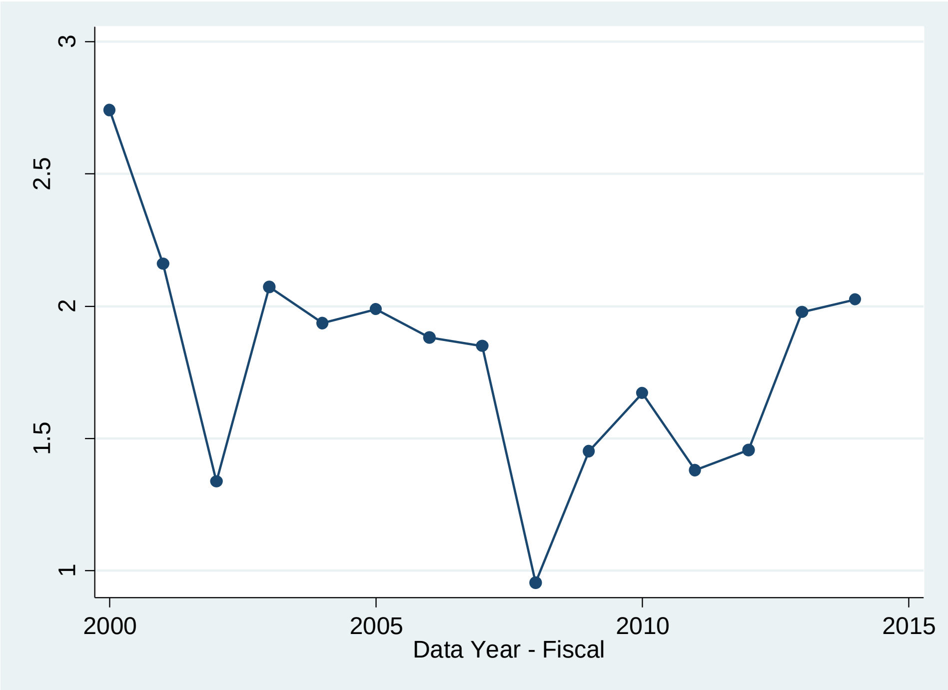
The following tests described above are necessary as the fixed effect regression assumptions must be tested before running the regression and obtaining the regression results. As was shown above, even though the fixed effect regression might be desirable as it controls for variables that are fixed over time, the Hausman test determines the appropriateness of a fixed effect regression (Wooldridge, 2015).

After conducting the time effect test, the following section will outline the time-series figures of the variations in the main variables (predictors and dependent variables) from the pre-crisis to the post-crisis period throughout the research timeframe.

7.5 Time-Series Figures of the Main Variables among Surviving Firms

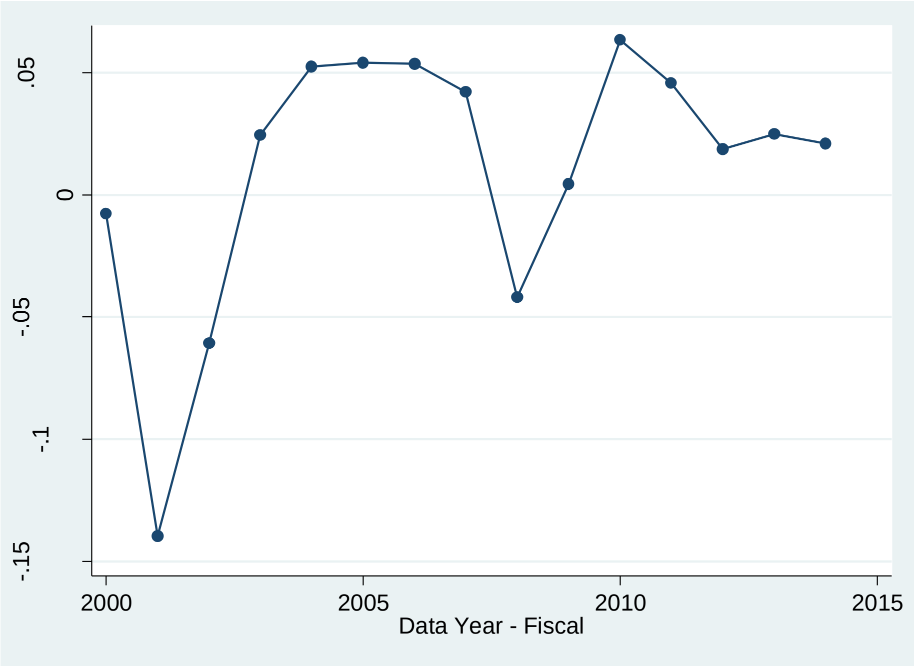
The time-series figures, which show the time variability of the mean of the main predictor variables (EO and its dimensions) and dependent variables (Tobin's Q and ROA) for the sample of firms from the pre-crisis to the post-crisis period can provide insight into the change of the main variables across time. The first figure will outline Tobin's Q, followed by ROA, EO, innovativeness, proactiveness, and finally risk taking.

Figure 7.12: Mean Value of Tobin's Q Time-Series Figure



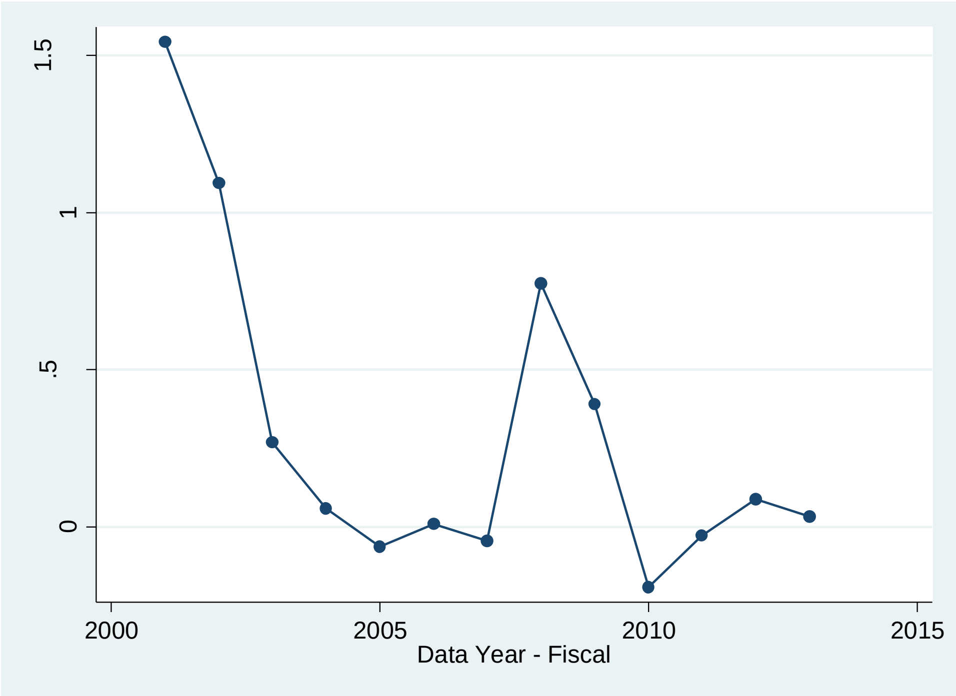
As can be shown in the figure 7.12 above, the dependent variable Tobin's Q was at its highest peak during year 2000. From year 2000 to 2002, it decreased significantly. Yet, from year 2002 to 2007, it increased to its second highest point. From year 2007 to 2008, it decreased significantly by the time of the financial crisis (year 2008). This indicates that Tobin's Q was increasing during the pre-crisis period and then decreased to its lowest point, less than 1 during the financial crisis. Yet, from year 2008 to 2010 it started to increase slightly. From year 2011 to 2015, it was increasing steadily as well.

Figure 7.13: Mean Value of ROA Time-Series Figure



For the dependent variable ROA as shown in figure 7.13 above, it decreased significantly from year 2000 until 2001 to its lowest point. After year 2001, it increased and remained steady until year 2007. From year 2007 to 2008 it decreased to its second lowest point. After year 2008 to 2010 it increased to its highest point. Yet after year 2010, it started decreasing again. Thus, similarly to Tobin's Q, ROA was soaring during the pre-crisis period. Yet during the financial crisis, ROA decreased similar to Tobin's Q.

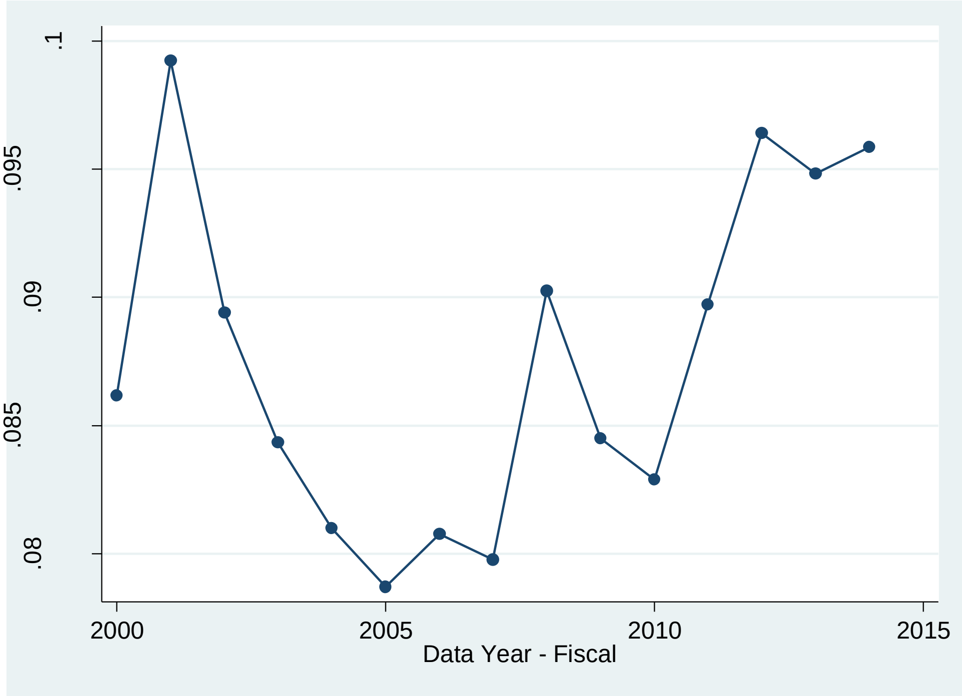
Figure 7.14: Mean Value of EO Time-Series Figure



Concerning EO in figure 7.14 above, it was at its highest peak during 2001, after which it decreased significantly to year 2007. Interestingly it increased significantly in year 2008 to its second highest peak, but then decreased significantly in year 2010, after which it started increasing slightly. This means that during the financial crisis, EO was present mostly and this is interesting since EO has always been considered to be advantageous for firms (Rauch et al., 2009).

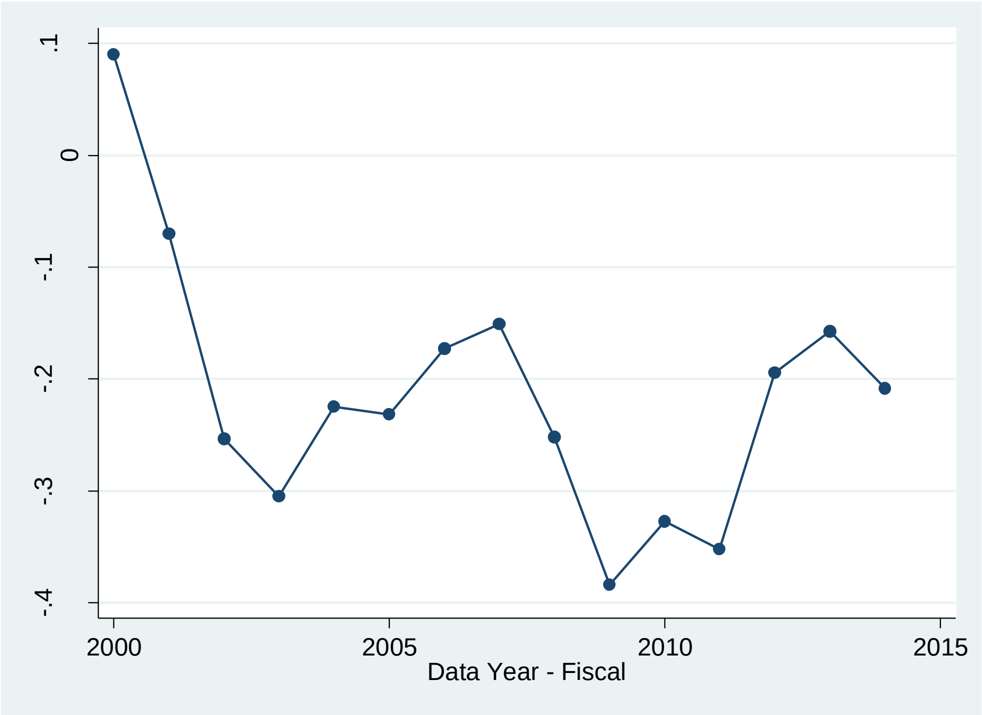
This brings questions into the nature of EO and its possibility of affecting a firm's standing. The figure could mean either two possibilities. It could mean either that an increase of EO was the result of the financial distress situation, in which firms sought to increase their EO in response to the crisis. The second explanation is that the increase of EO might have contributed to the financial crisis itself (Slevin & Terjesen, 2011). To test which option aligns most with the actual events, the panel regressions were conducted to test the effects of EO and its dimensions on firm performance. The effect of EO was also examined on firm failure in chapter 9.

Figure 7.15: Mean Value of Innovativeness Time-Series Figure



In the case of innovativeness as shown in figure 7.15 above, it was at its highest point in year 2001 until it decreased significantly in year 2007 to its lowest point. From year 2007 to 2008, it increased to its third highest peak. Yet from year 2008 to 2010, it decreased again. After year 2010, it started to increase with a significant spike.

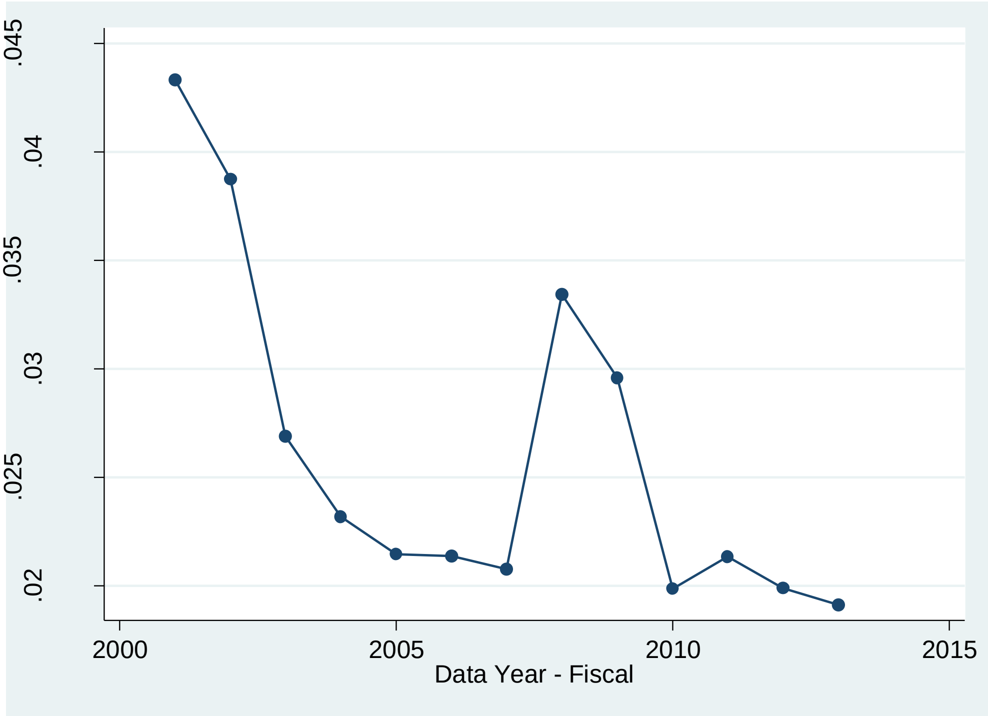
Figure 7.16: Mean Value of Proactiveness Time-Series Figure



Proactiveness, as shown in figure 7.16 above, was at its highest peak during year 2000. From year 2000 until 2004, it decreased significantly. From year 2004 until 2007, it continued to increase until it reached its second highest peak during year 2007. From year 2007 until 2008, it decreased and continued to decrease significantly until year 2009. From year 2011 until 2013 it started to increase slightly, yet after year 2013 it started to decrease again.

The above figure of proactiveness shows a different time variation from the figure of EO and innovativeness, in which proactiveness was decreasing during the financial crisis.

Figure 7.17: Mean Value of Risk Taking Time-Series Figure



In the case of risk taking, as shown in figure 7.17, it was at its highest point in year 2001, after which it decreased significantly to year 2007. From year 2007 until 2008, it increased to its second highest peak. Yet, after year 2008, it decreased significantly to its lowest point in year 2010. From year 2010 until 2011, it increased slightly, but after which it decreased again.

Interestingly, similar to EO, risk taking and innovativeness (except for proactiveness) as shown from the figures increased during the financial crisis period. The financial innovation that soared during the financial crisis was spreading the risk further and could entail that the innovation that was present during the financial crisis aligned with the dark side or the alternative view of EO as the "EO-as-Experimentation perspective", which considers EO as a double-edged sword (Wiklund & Shepherd, 2011).

Most importantly, the different time variation of proactiveness from the rest of the EO dimensions might signal that the EO dimensions are independent and have different effects as postulated by Lumpkin and Dess (1996).

Lastly, it was shown that the time effect was significant to include in the regressions. Thus, time dummies (including the financial crisis) were included in the regressions.

Before outlining the main regression results, the next section will outline the discrepancy between the R-squared and adjusted R-squared value.

7.6 Fitness of the Fixed Effect Regression Model among Surviving Firms

The reported within transformation R-squared of the fixed effect regression is incorrect since it subtracts all fixed effects; essentially giving a low value for the R-squared. Thereby, the R-squared from the OLS regression (fixed for firm and industry effects) is reported instead by creating dummies for the firm, industry, as well as time (Cameron & Trivedi, 2010). Thus, in section 7.8, which outlines the main regression results, the adjusted R-squared value is presented instead of the R-squared value.

Table 7.24: R-squared Value of the Regression Models

Regressions	**R-Squared**	**Adjusted R-Squared**
Tobin’s Q and EO	0.718	0.677
Tobin’s Q and EO Dimensions	0.721	0.681
ROA and EO	0.562	0.499
ROA and EO Dimensions	0.591	0.532

Accordingly, as shown in table 7.24 above, the adjusted R-squared of the regression of Tobin’s Q and EO/EO dimensions in the regressions, including dummies for industry, firm, and time was 0.68. This showed that 68% of the changes in Tobin’s Q is explained by the variables in the regressions of Tobin’s Q and EO/EO dimensions (whereas the R-squared value is 0.72). Thus, the full regression has a strong explanatory power. Finally, the adjusted R-squared value of ROA and EO was 0.5 and showed that 50% of the changes in ROA was explained by the variables in the full regression of ROA and EO. Lastly, in the regression of ROA and the EO dimensions, the R-squared was 0.53, which indicated that 53% of the changes in ROA was explained by the regression.

The next section will outline the synopsis to the fixed effect regression results section.

7.7 Synopsis to the Panel Fixed Effect Regression Results among Surviving Firms

The coefficients of the regression were interpreted in terms of how much the dependent variable changes in standard deviation terms with one standard deviation change in the predictor variable(s). However, the variables which were log transformed (e.g. firm size and firm age) were interpreted in percentage terms. This would indicate how much the dependent variable changed in a percentage with one standard deviation change in x.

For the hypothesis testing, the two-tail p-value test was used, in which it tests whether each coefficient of the explanatory variables is significantly different from zero. To reject this null hypothesis, the t-value should be higher than 1.96 or p-value should be lower than 0.05 within the 95% confidence interval. Yet, in the tables of the regression results, variables with p-values lower than 0.1 were marked. The lower the p-value or the higher the t-value, the more significant effect the explanatory variable(s) had on the dependent variable.

The next section will outline the main regression results.

7.8 Regression Analysis Results among Surviving Firms

In this chapter, the fixed effect regression method was employed (with robust clustered standard errors). To examine the relationship between Tobin's Q/ROA and the main variables of the EO dimensions as well as EO.

The below tables 7.25 and 7.26 represent the result of the fixed effect regression of each of the dependent variables (Tobin's Q and ROA) with the main explanatory and control variables. The different regression models are in the below tables.

Model 1 indicates the relationship between the dependent variables and the controls only.

Model 2 shows the relationship between the dependent variables and EO.

Model 3 shows the relationship between the dependent variables and the EO dimensions (innovativeness, proactiveness, risk taking) in separate models. Model 3a shows the results of the model including innovativeness only. Model 3b shows the results of proactiveness only.

Lastly, model 3c shows the results of risk taking. Splitting the EO dimensions was important since proactiveness and innovativeness were shown to be highly correlated with a correlation of 0.62 in the regression of Tobin's Q.

Below there are two tables each outlining the results of models 1, 2, and 3a, 3b, and 3c. The first table 7.25 below shows the results of the effects of EO and its dimensions on Tobin's Q with the time dummies. The second table 7.26 outlines the results of the regression of the effects of EO and its dimensions on ROA whilst including time dummies.

The last table 7.27 shows the summary results of the regressions of EO and its dimensions on Tobin's Q and ROA, with the time dummies included.

In the below tables 7.25 and 7.26, the coefficients are under the column B and the robust standard errors are under the column labelled as RSE. The t-values are presented in parentheses, under the coefficients. Innovativeness has been abbreviated as 'innov', proactiveness as 'proac', risk taking as 'risk', systematic risk as 'sys risk'. Furthermore, the number of observations, with the cluster of firms in parentheses, were abbreviated as N, the adjusted R-squared as Adj. $R^{\wedge 2}$, and the F-test as F.

Table 7.25: Fixed Effect Regression Results of the Effects of EO and its Dimensions on Tobin's Q with Time dummies

Tobin's Q	Model 1		Model 2		Model 3a		Model 3b		Model 3c	
Predictors	B	RSE	B	RSE	B	RSE	B	RSE	B	RSE
Sys Risk	0.122**** (4.88)	0.025	0.126**** (5.01)	0.0252	0.126**** (5.09)	0.0249	0.122**** (4.9)	0.025	0.144**** (5.75)	0.025
Investment Opportunity	0.076**** (3.52)	0.021	0.0739*** (3.37)	0.0219	0.081**** (3.79)	0.021	0.0802**** (3.72)	0.021	0.0705*** (3.23)	0.021
Firm size	-0.251*** (-2.99)	0.0839	-0.265*** (-3.09)	0.0858	-0.212** (-2.6)	0.0817	-0.22*** (-2.65)	0.083	-0.276** (-3.23)	0.085
Firm age	-0.029 (-0.36)	0.079	-0.027 (-0.34)	0.0825	-0.035 (-0.46)	0.0787	-0.025 (-0.32)	0.079	-0.049 (-0.6)	0.082
Leverage	-0.113**** (-3.72)	0.0305	-0.113**** (-3.66)	0.0308	-0.108**** (-3.69)	0.0295	-0.12**** (-4.16)	0.028	-0.106*** (-3.49)	0.03
Liquidity	0.068* (1.83)	0.037	0.063 (1.66)	0.038	0.078** (2.13)	0.0368	0.071* (1.95)	0.036	0.057 (1.57)	0.036
EO			-0.007 (-0.23)	0.0312						
EO$^{\wedge 2}$			-0.0028** (-2.5)	0.0011						
Innov					0.115** (2.39)	0.048				
Proac							-0.054 (-0.88)	0.0618		
Risk									-0.074** (-2.61)	0.028
Constant	0.269*** (3.42)	0.078	0.3*** (3.5)	0.085	0.263*** (3.4)	0.077	0.282**** (3.54)	0.079	0.355**** (4.3)	0.082
Time Dummies	Yes		Yes		Yes		Yes		Yes	
Adj. R^2	0.67		0.677		0.679		0.677		0.678	
N	2545(295)		2504(292)		2545(295)		2544(294)		2505(293)	
F	27.85		24.41		25.81		26.58		25.52	
Prob(F)	0		0		0		0		0	

t-statistics in parentheses. *p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

Table 7.25 above shows the results of the models of the effects of EO and its dimensions on Tobin's Q whilst including the time dummies. This table tests for *H2b* on the effect of EO on long-term performance and for *H6b*, *H7b*, and *H8b* on the effect of the EO dimensions (innovativeness, proactiveness, risk taking) on long-term performance. Model 2, which includes EO tested for hypothesis *H2b.* Model 3a, which includes innovativeness, tested for hypothesis *H6b.* Model 3b, which includes proactiveness, tested for hypothesis *H7b*. Model 3c, which includes risk taking, tested for hypothesis *H8b*.

In model 1, which includes the control variables, systematic risk (t=4.88) and investment opportunity (t=3.52) had a significant positive effect on Tobin's Q at the 1% level. Firm size (t=-2.99) and leverage (t=-3.72) had a significant negative effect on Tobin's Q at the 1 % level. The model with the time dummies explained 67% of the changes in Tobin's Q.

Model 2, which includes EO and its squared term, revealed that the squared term of EO had a significant negative effect on Tobin's Q at the 5% level (t=-2.5). It is important to note that without the time dummies both the linear and quadratic term of EO were shown to be negative and significant. The EO and Tobin's Q relationship was predominantly a negative inverse U-shaped relationship. The quadratic relationship was validated by figure 7.5. Thereby, hypothesis *H2b* was supported. As for the control variables, systematic risk and investment opportunity had a significant positive effect at the 1% level. Firm size and leverage had a significant negative effect on Tobin' Q at the 1 % level. The model explained 67.7 % of the changes in Tobin's Q.

Model 3a, which includes only innovativeness, revealed that innovativeness (t=2.39) had a significant positive effect on Tobin's Q at the 5% level confirming hypothesis *H6b*. Systematic risk and investment opportunity had a significant positive effect at the 1 % level. Firm size had a significant negative effect on Tobin's Q at the 5% level. Leverage had a significant negative effect on Tobin's Q at the 1% level. Lastly liquidity (t=2.13) had a significant positive effect on Tobin's Q at the 5% level. The adjusted R-squared was 0.679, which means that by including innovativeness, the model explained 67.9 % of the changes in Tobin's Q.

Model 3b, which includes proactiveness only, showed that proactiveness had an insignificant effect on Tobin's Q. Thereby, hypothesis *H*7b was not supported. Systematic risk and investment opportunity had a significant positive effect at the 1 % level. Firm size and leverage had a significant negative effect on Tobin's Q at the 1% level. The model explained 67.7 % of the changes in Tobin's Q.

Model 3c, which includes only risk taking, revealed that risk taking (t=-2.61) had a significant negative effect on Tobin's Q at the 5% level, confirming hypothesis *H8b*. Systematic risk and investment opportunity had a significant positive effect at the 1 % level. Leverage was shown to have a negative effect on Tobin's Q at the 1% level. Firm size had a significant negative effect on Tobin's Q at the 5% level. The model explained 67.8 % of the changes in Tobin's Q.

Table 7.26: Fixed Effect Regression Results of the Effects of EO and its Dimensions on ROA with Time dummies

ROA	Model 1		Model 2		Model 3a		Model 3b		Model 3c	
Predictors	B	RSE	B	RSE	B	RSE	B	RSE	B	RSE
Sys Risk	-0.076** (-2.35)	0.0327	-0.0128 (-0.39)	0.0329	-0.095*** (-3.14)	0.03	-0.079** (-2.51)	0.031 6	-0.034 (-1.15)	0.029
Investment Opportunity	0.203**** (8.58)	0.0237	0.18**** (7.8)	0.023	0.189**** (8.08)	0.023	0.171**** (7.29)	0.023	0.164**** (6.77)	0.024
Firm size	-0.152 (-1.63)	0.0938	-0.2** (-2.17)	0.092	-0.306*** (-3.32)	0.092	-0.396**** (-4.47)	0.088	-0.176* (-1.91)	0.092
Firm age	0.318**** (3.71)	0.0859	0.211*** (2.68)	0.079	0.347**** (4.02)	0.086	0.292*** (3.34)	0.087	0.126 (1.57)	0.080
Leverage	-0.148*** (-3.41)	0.0436	-0.14*** (-3.35)	0.0419	-0.167*** (-3.49)	0.047	-0.094** (-2.04)	0.046	-0.109*** (-2.67)	0.040
Liquidity	0.15**** (3.73)	0.04	0.1** (2.51)	0.039	0.108*** (2.7)	0.04	0.123*** (3.11)	0.039	0.123*** (3.18)	0.038
EO			-0.325**** (-8.75)	0.037						
$EO^{\wedge 2}$			-0.013**** (-5.45)	0.0024						
Innov					-0.46**** (-7.04)	0.065				
Proac							0.435**** (5.82)	0.074		
$Risk^{\wedge 2}$									-0.117**** (-7.67)	0.015
Constant	-0.286*** (-3.11)	0.0919	0.167* (1.86)	0.089	-0.264*** (-2.95)	0.089	-0.387**** (-4.28)	0.09	-0.068 (-0.8)	0.085
Time dummies	Yes		Yes		Yes		Yes		Yes	
Adj. R^2	0.45		0.499		0.49		0.475		0.494	
N	2548(295)		2507(292)		2548(295)		2547(294)		2508(292)	
F	13.22		20.39		14.44		13.28		17.18	
Prob(F)	0		0		0		0		0	

t-statistics in parentheses. *p<0.1 ** p<0.05, *** p<0.01, **** p<0.001

Table 7.26 above outlines the results of the models, in which the effect of EO and its dimensions was tested against ROA, whilst including time dummies. The regression models in the above table tested for *H2a* on the effect of EO on short-term performance and for *H6a*, *H7a*, and *H8a* on the effect of the EO dimensions (innovativeness, proactiveness, risk taking) on short-term performance. Model 2, which includes EO tested for hypothesis *H2a.* Model 3a, which includes innovativeness, tested for hypothesis *H6a.* Model 3b, which includes proactiveness, tested for hypothesis *H7a*. Model 3c, which includes risk taking, tested for hypothesis *H8a*.

In model 1, which includes the control variables, systematic risk (t=-2.35) had a significant negative effect on ROA at the 5 % level. Investment opportunity (t=8.58) and firm age (t=3.71) had a significant positive effect on ROA at the 1% level. Leverage (t=-3.41) had a negative effect at the 1 % level. Lastly, liquidity (t=3.73) had a significant positive effect at the 1% level. The model explained 45 % of the changes in ROA.

Model 2, which includes EO (t=-5.45), revealed a significant, predominantly negative, inverse U-shaped relationship between EO and ROA at the 1% level, confirming hypothesis *H2a.* The quadratic relationship was validated by figure 7.6. Investment opportunity and firm age had a positive effect significant at the 1% level. Firm size (t=-2.17) had a significant negative effect on ROA at the 5% level. Leverage had a significant negative effect at the 1 % level. Liquidity had a significant positive effect on ROA at the 5% level. The model explained 49.9 % of the changes in ROA.

Model 3a, which includes only innovativeness, revealed that innovativeness (t=-7.04) had a significant negative effect on ROA at the 1% level, confirming hypothesis *H6a*. Systematic risk (t=-3.14) had a significant negative effect at the 1 % level. Investment opportunity, firm age, and liquidity had a significant positive effect at the 1 % level. Firm size and leverage had a significant negative effect on ROA at the 1 % level. The model explained 49 % of the changes in ROA.

Model 3b, which includes proactiveness, showed that proactiveness (t=5.82) had a significant positive effect on ROA at the 1 % level, confirming hypothesis *H7a*.

Systematic risk had a significant negative effect on ROA at the 5 % level. Investment opportunity, firm age, and liquidity had a significant positive effect at the 1 % level. Firm size (t=-4.47) had a significant negative effect at the 1 % level. Leverage had a significant negative effect on ROA at the 5% level. The model explained 47.5 % of the changes in ROA.

Model 3c, which includes risk taking, revealed that risk taking (t=-7.67) had a concave decreasing relationship with ROA significant at the 1 % level, providing support for hypothesis *H8a*. The quadratic relationship was validated by figure 7.7. Investment opportunity and liquidity had a significant positive effect on ROA at the 1 % level. Leverage had a significant negative effect at the 1 % level. The model explained 49.4 % of the changes in ROA.

The next section will outline the summary table of the main results of the effects of EO and its dimensions, whilst including the time dummies in the full model.

Table 7.27: Summary of Regression Results with Time dummies among Surviving firms

Main Variables	**Tobin's Q**	**ROA**
EO	Inverse U-shaped significant at 5% level (in support of *H2b*)	Inverse U-shaped significant at 1% level (in support of *H2a*)
Innovativeness	Positive significant at 5% level (in support of *H6b*)	Negative significant at 1% level (in support of *H6a*)
Proactiveness	Insignificant (negative) (does not support of *H7b*)	Positive significant at 1% level (in support of *H7a*)
Risk taking	Significant negative at 5% level (in support of *H8b*)	Inverse U-shaped significant at 1% level (in support of *H8a*)

The following table 7.27 summarises the results of the panel fixed effect regressions of the effects of EO and its dimensions on each of Tobin's Q and ROA. The results of the regression aligned with the initial consideration by Lumpkin and Dess (1996) that each of the EO dimensions have distinct effects on the measures of firm performance (short-term and long-term performance) and even distinctive when considering their individual effects on each measure of firm performance. Thereby, it was important to consider their separate effects rather than combining them into the overall gestalt construct EO. The discussions section will discuss the significance of these results further.

EO was shown to have a significant inverse U-shaped relationship with both measures of firm performance (Tobin's Q and ROA) confirming hypotheses *H2a* and *H2b*. Innovativeness was shown to have a negative effect on short-term performance (ROA), confirming hypothesis *H6a*. Furthermore, innovativeness had a positive effect on long-term performance (Tobin's Q), confirming hypothesis *H6b*. In contrast to innovativeness, proactiveness was shown to have a significant positive effect on ROA, confirming hypothesis *H7a*; yet it had an insignificant effect on Tobin's Q, thus not supporting hypothesis *H7b*. Risk taking was shown to have a quadratic negative effect on ROA, confirming hypothesis *H8a* and was shown to have a significant negative effect on Tobin's Q, confirming hypothesis *H8b.*

The next section will outline the results of the effects of the different values of EO on the examined measures of firm performance.

7.9 Effects of Low and High Values of EO on Tobin's Q and ROA among Surviving Firms

The following section examines the effects of different values of EO on both measures of firm performance (Tobin's Q and ROA). The results of the different assigned margins of EO (from -10 to 10) are shown in table 7.28 These results were generated after running the regression of Tobin's Q/ROA against the EO and the control variables to examine the effect of EO and its dimensions on firm performance. The figures 7.18 and 7.19 demonstrate the effects.

This section presents the effects of the different values of EO on firm performance, to further test hypotheses *H2a* and *H2b.* The testing draws insights from organisational learning and prospect theory, which consider that higher values of EO can be detrimental for a firm.

The above results in tables 7.25 and 7.26 showed that EO had a significant inverse U-shaped relationship with short-term and long-term firm performance. Thereby, it was important to extend the regression results and examine the effects of the different ranges of values of EO on firm performance as well.

Table 7.28: Effect of Different Values of EO on Tobin's Q/ROA

EO	**Tobin's Q**	**ROA**
Margin 1(EO=10)	-0.696***	-3.566****
Margin 2 (EO=5)	-0.3708***	-1.722****
Margin 3 (EO=0)	-0.045****	0.122****
Margin 4(EO=-5)	0.279**	1.966****
Margin 5(EO=-10)	0.604**	3.811****

*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

Figure 7.18: Marginsplot of Tobin's Q and EO

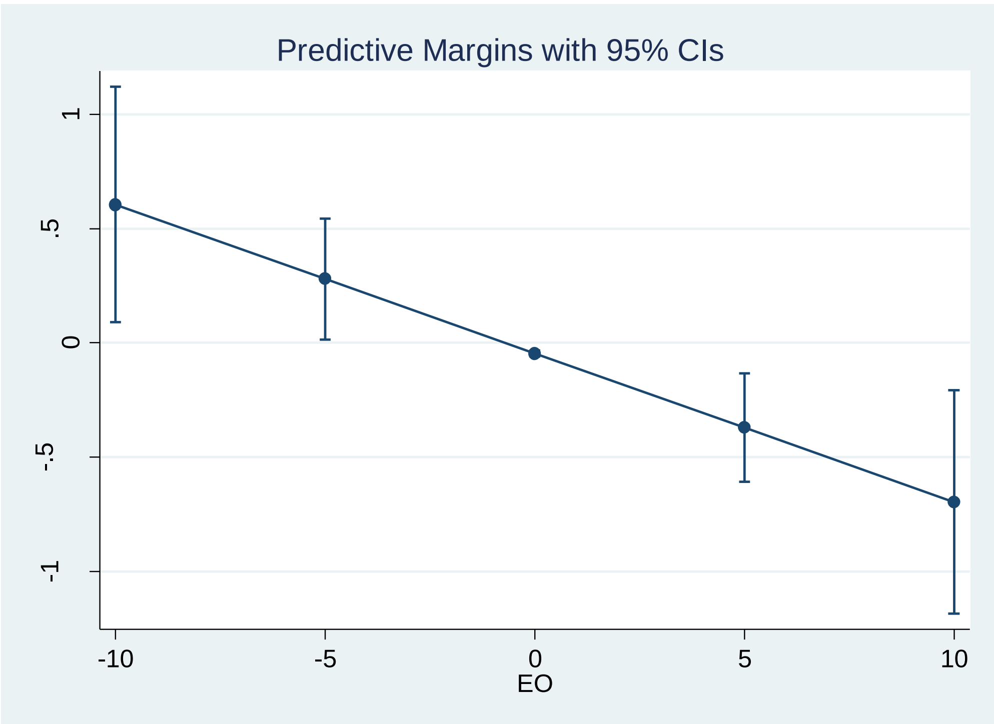
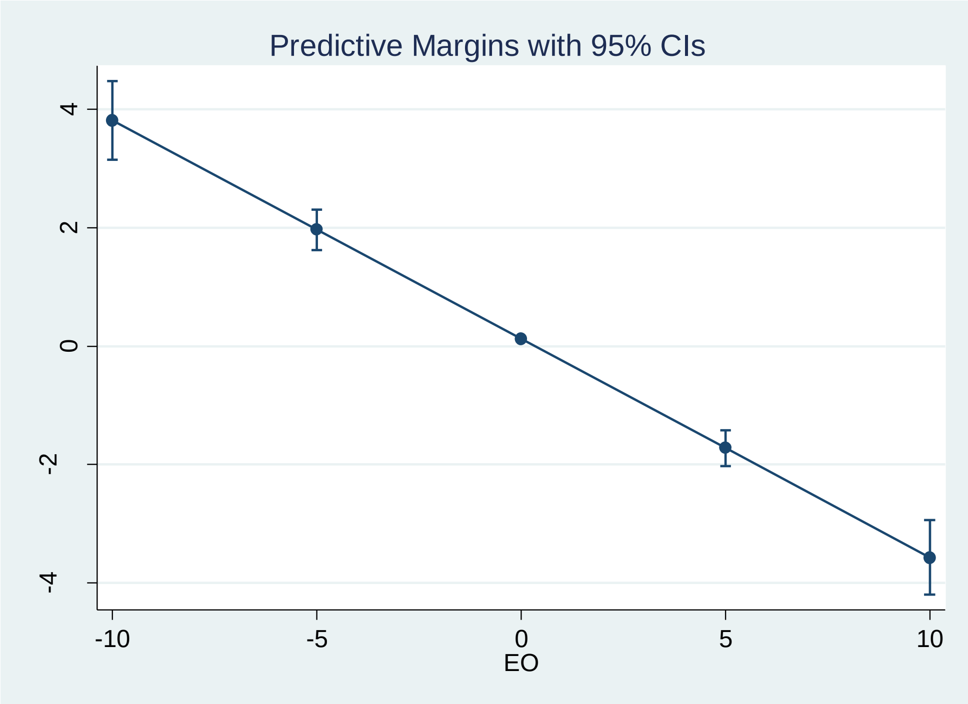


Figure 7.19: Marginsplot of ROA and EO



As indicated earlier, the U-test of the effect of EO on firm performance measures in tables 7.9 and 7.10 showed a significant non-linear EO-firm performance relationship. It was also important to examine the effects of the different values of EO on Tobin's Q and ROA. EO values ranged from -21.77 to 8.67.

The results of the different assigned margins of EO are shown in table 7.28 above, which were generated after running the regression of Tobin's Q/ROA against the EO and the control variables. The results indicated that EO at lower values had a significant positive effect on Tobin's Q/ROA whereas values of EO at higher levels had a significant negative effect on Tobin's Q/ROA. Furthermore, the higher EO values had a stronger negative effect on firm performance. For instance, in the regression of Tobin's Q, EO=10 had a B=-0.69 whereas EO=5 had a B=-0.37. The graphic representation of the effect of EO on Tobin's Q/ROA are shown in figures 7.18 and 7.19 above, in which the lower EO values had a positive effect on Tobin's Q and ROA and the higher EO values had a negative effect on Tobin's Q/ROA. Thereby, according to the marginsplots and table 7.28, the results showed that the higher the value of EO, the greater its negative effect on firm performance. Thereby, hypothesis *H2a* and *H2b* were supported.

The next section will outline the robustness tests of the effects of EO and its dimensions. Then, lastly a section will present the effects of the different forms of innovativeness that were used.

7.10 Robustness Check: Endogeneity Checks of the Effect of EO and its Dimensions on Firm Performance among Surviving Firms

This section outlines the results of the endogeneity tests, as a robustness check, of each of the main predictor variables of EO and its dimensions (innovativeness, proactiveness, and risk taking) by using their lagged values (t-1, and t-2 years lagged) as the instrument on Tobin's Q and ROA and clustering by firm-level. In the literature, authors have utilised the fixed effect regression since it controls for endogeneity issues and issues of reverse causality (Gupta & Gupta, 2015). Yet, this research has moved a step forward by testing for endogeneity.

This section will first outline the results from the effect of EO on Tobin's Q and ROA regressions, followed by innovativeness, proactiveness, and lastly risk taking. If endogeneity is shown to be present, by rejecting the null hypothesis of exogeneity, then the effect of the lagged value of the predictor variables (EO and its dimensions) is tested on the dependent variables (firm performance measures) to validate the results from the main fixed effect regressions.

7.10.1 Robustness of the Effect of EO on Firm Performance

This section outlines the results of the endogeneity test of the effect of EO on the firm performance measures (Tobin's Q and ROA).

Table 7.29: Robustness Check of Fixed Effect Regression Results of the Effect of EO on Firm Performance including Time Dummies

EO	Tobin's Q	ROA
Endogeneity Test	0.615 (0.433)	0.09 (0.764)
Under-identification Test	12.077 (0.002)	12.073 (0.002)
Sargan-Hansen Statistics (Over-identification	0.955 (0.328)	1.017 (0.313)

p-value in parentheses

The following table 7.29 represents results from the Sargan-Hansen test (Hansen, 1982; Sargan, 1958) and endogeneity test. The tests are conducted based on an instrumental variable (IV) estimation of the panel fixed effect regressions. These tests determine whether the main EO construct was endogenous with firm performance, in the form of reverse causality. The Under-identification tests the null hypothesis that the equation is under-identified, and the instruments used are uncorrelated with the endogenous regressors. The results of the under-identification test showed that the null hypothesis of the under-dentification test was rejected, which means that the equation was identified, and the instruments were relevant.

The Sargan-Hansen test (Hansen, 1982; Sargan, 1958) of over-identifying restrictions tests the null hypothesis that the instruments are valid and uncorrelated with the error term. The results of the Sargan-Hansen test (Hansen, 1982; Sargan, 1958) showed that the null hypothesis could not be rejected. Finally, the endogeneity test tested the null hypothesis that the EO construct is considered to be exogenous. According to the results of the endogeneity test, we failed to reject the null hypothesis, which means that there were no issues of endogeneity when examining the EO and firm performance relationship. Thereby, the fixed effect regression results of the EO-firm performance relationship without the IV estimation were valid. This validated hypotheses *H2a* and *H2b* on the effect of EO on short-term and long-term performance among surviving firms.

The next section will present the endogeneity test results from the effect of innovativeness on firm performance.

7.10.2 Robustness of the Effect of Innovativeness on Firm Performance

This section represents the results of the endogeneity test of the effect of innovativeness on firm performance.

Table 7.30: Robustness Check of Fixed Effect Regression Results of the Effect of Innovativeness on Firm Performance including Time Dummies

Innovativeness	**Tobin's Q**	**ROA**
Endogeneity Test	2.013 (0.156)	24.886 (0.0)
Under-identification Test	52.018 (0.0)	19.768 (0.0001)
Sargan-Hansen Statistics (Over-identification	3.59 (0.058)	0.211 (0.646)

p-value in parentheses

The above table 7.30 shows the results of the endogeneity test of the effect of innovativeness dimension on firm performance measures (Tobin's Q and ROA). In the case of Tobin's Q as the firm performance measure, innovativeness passed the exogeneity assumption. Thereby, the results of the fixed effect regression of innovativeness dimension of EO on the long-term measure of firm performance, Tobin's Q, were valid as there was no endogeneity issue. However, using ROA as the dependent variable, the endogeneity test of the innovativeness dimension rejected the null hypothesis of exogeneity. Thereby, the results of the lagged values of innovativeness on ROA are presented below in table 7.31. By testing the lagged values of innovativeness on ROA, this would address the endogeneity issues.

Table 7.31: Robustness of the Lagged Effect of Innovativeness on ROA

ROA	Lag 1	Lag 2	Lag 3
Innovativeness	0.136*** (3.00)	0.23**** (5.02)	0.196**** (3.69)
Systematic Risk	-0.078** (-2.31)	-0.05 (-1.58)	0.02 (0.65)
Investment opportunity	0.212**** (8.47)	0.185**** (6.9)	0.164**** (6.27)
Firm size	-0.107 (-1.10)	-0.126 (-1.24)	0.03 (0.34)
Firm age	0.296*** (3.42)	0.286** (2.16)	0.07 (0.62)
Leverage	-0.148*** (-3.52)	-0.127*** (-3.09)	-0.187**** (-4.27)
Liquidity	0.15**** (3.86)	0.129*** (3.11)	0.121*** (2.86)
Constant	-0.276*** (-2.99)	-0.126* (-1.78)	0.121** (2.28)
N	2502(292)	2210(263)	1949(242)

t statistics in parentheses
*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

The above table 7.31 shows the lagged results of innovativeness on ROA. The results indicated that the lagged value of innovativeness by 1 year (t-1) had a significant positive effect on ROA at the 1% level (p-value=0.003<0.01). This was even more significant when lagged by 2 years (t-2) (p-value=0.000<0.001) and was still significant when lagged backwards by 3 years (p=0.000<0.001). The results indicated that a one standard deviation increase in innovativeness (at t-1) led to a 13.6 standard deviation increase in ROA (at t). This is different from the non-lagged value of innovativeness, in section 7.7, which showed a significant negative effect on ROA.

The results of the lagged values of innovativeness aligned with the results of the effect of innovativeness on Tobin's Q. The significant positive effect of the lagged values of innovativeness on ROA indicated that over time innovativeness led to a positive firm performance.

The above results showed that hypothesis *H6a*, on the effect of innovativeness on short-term performance, was not supported due to endogeneity. *H6b* on the effect of innovativeness on long-term performance was still supported due to lack of endogeneity.

The next section will outline the robustness check of the effect of the proactiveness dimension of EO on firm performance.

7.10.3 Robustness of the Effect of Proactiveness on Firm Performance

This section presents the endogeneity test results of the proactiveness dimension on firm performance (Tobin's Q and ROA).

Table 7.32: Robustness Check of Fixed Effect Regression Results of the Effect of Proactiveness on Firm Performance including Time Dummies

Proactiveness	**Tobin's Q**	**ROA**
Endogeneity Test	5.231 (0.022)	33.59 (0.0)
Under-identification Test	52.332 (0.0)	56.084 (0.0)
Sargan-Hansen Statistics (Over-identification	1.49 (0.222)	7.379 (0.06)

p-value in parentheses

The above table 7.32 shows that the proactiveness dimension of EO was endogenous with both measures of firm performance. Thereby, the lagged values of the proactiveness dimension was tested on both measures of firm performance as will be shown in the tables below.

The first table will present the effect of the lagged values of proactiveness on Tobin's Q followed by the effect of its lagged values on ROA.

Table 7.33: Robustness Check of Fixed Effect Regression Results of the Effect of Proactiveness on Tobin's Q including Time Dummies

Tobin's Q	**Lag 1**	**Lag 2**	**Lag 3**
Proactiveness	-0.132*** (-3.34)	-0.099** (-2.28)	-0.033 (-0.57)
Systematic Risk	0.125**** (4.93)	0.101**** (4.02)	0.134 (5.45)
Investment opportunity	0.078**** (3.63)	0.052*** (2.7)	0.037* (1.98)
Firm size	-0.176** (-2.1)	-0.135* (-1.7)	-0.19** (-2.1)
Firm age	-0.042 (-0.53)	-0.041 (-0.41)	0.0103 (0.07)
Leverage	-0.123**** (-4.16)	-0.12**** (-4.11)	-0.121 (-3.57)
Liquidity	0.067* (1.83)	0.035 (0.98)	0.0304 (0.82)
Constant	0.308**** (3.88)	-0.178 (-2.86)	0.297**** (4.75)
N	2499 (292)	2207(263)	1946(242)

t statistics in parentheses
*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

The above table 7.33 shows the results of the regression model that includes only the proactiveness dimension of EO (by lagging backwards proactiveness by 1 year, 2 years, and 3 years). The results indicated that proactiveness after a one-year lag (t-1) had a significant negative effect on Tobin's Q at the 1% level. The results also indicated that one standard deviation increase in proactiveness led to 13.2 standard deviation decrease in Tobin's Q.

This is quite different from the non-lagged value of proactiveness, which did not have a significant effect on Tobin's Q. The negative effect of proactiveness on Tobin's Q was still significant after 2-year lags (t-2) (p<0.05).

The above results supported evidence for hypothesis *H7b,* on the effect of proactiveness on long-term performance.

The below table will present the effect of the lagged values of proactiveness on ROA.

Table 7.34: Robustness Check of Fixed Effect Regression Results of the Effect of Proactiveness on ROA including Time Dummies

ROA	**Lag 1**	**Lag 2**	**Lag 3**
Proactiveness	-0.513**** (-7.20)	-0.594**** (-9.23)	-0.367**** (-6.81)
Systematic Risk	-0.0729** (-2.10)	-0.047 (-1.49)	0.02 (0.69)
Investment opportunity	0.219**** (8.37)	0.153**** (5.87)	0.141**** (5.5)
Firm size	0.179 (1.63)	0.191* (1.81)	0.192** (2.11)
Firm age	0.283*** (3.19)	0.255** (2.11)	0.055 (0.52)
Leverage	-0.196**** (-4.99)	-0.157**** (-4.32)	-0.189**** (-4.73)
Liquidity	0.155**** (4.14)	0.142**** (3.61)	0.137*** (3.21)
Constant	-0.136 (-1.43)	0.023 (0.32)	0.195**** (3.66)
N	2502(292)	2210(263)	1949(242)

t statistics in parentheses
*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

The above table 7.34 shows the results of the effect of the lagged values of proactiveness on ROA. As the table reveals, the lagged value of proactiveness by 1 year (t-1) showed a significant negative effect on ROA (p-value=0.000<0.001). This was still significant and negative when lagged by 2 years (t-2) (p-value=0.000<0.001) and when lagged backwards by 3 years (p=0.000<0.001).

The results of the 1-year lag of proactiveness are interpreted as such: the lagged value of proactiveness at t-1 leads to a 51.3 % decrease in ROA. When lagged by 2 years, proactiveness leads to 59.4 % decrease in ROA. When lagged by 3 years at t-3 proactiveness leads to 36.7 % decrease in ROA.

The results of the lagged values of proactiveness were quite different from the non-lagged value of proactiveness on ROA, which was shown to have a significant positive effect on ROA. The effects of the lagged values of proactiveness aligned with the effect of proactiveness on Tobin's Q, which was shown to be negative. Thereby, this shows that over time proactiveness had a negative effect on firm performance.

The above results indicated that hypothesis *H7a*, on the effect of proactiveness on short-term performance, was not supported due to endogeneity.

The next section will present the results from the endogeneity test of risk taking, dimension of EO.

7.10.4 Robustness of the Effect of Risk taking on Firm Performance

This section presents the endogeneity test results of risk taking on firm performance measures (Tobin's Q and ROA).

Table 7.35: Robustness Check of Fixed Effect Regression Results of the Effect of Risk taking on Firm Performance including Time Dummies

Risk taking	**Tobin's Q**	**ROA**
Endogeneity Test	0.001 (0.97)	1.112 (0.291)
Under-identification Test	19.127 (0.0001)	19.002 (0.0001)
Sargan-Hansen Statistics (Over-identification	3.499 (0.061)	2.211 (0.137)

p-value in parentheses

The above table 7.35 shows the results of the endogeneity test of the effect of risk taking on the firm performance measures (Tobin's Q and ROA). The endogeneity test results of risk taking on both measure of firm performance indicated that there was no endogeneity issue. Thereby, the fixed effect results of risk taking without the IV estimation provided valid results.

The above results showed that hypothesis *H8a* and *H8b*, on the effect of risk taking on short-term and long-term performance, were validated.

The next section will outline the robustness check from the different measures of the innovativeness dimension of EO that were used instead of the main innovativeness measure as R&D intensity (R&D/total assets).

7.11 Robustness Check: Alternative Forms of Innovativeness among Surviving Firms

The following section shows the robustness check from the alternative measures of innovativeness. The first measure termed intangible innovation was used to account for a measure of innovation independent of a firm's business cycle and spurious effects from asset sales. The second measure is termed patent yield and measures the ratio of the number of patents at application date divided by R&D expenditure. This section reveals the different results that were found using the different measures of innovativeness.

Table 7.36: Effect of Alternative Forms of Innovativeness on Tobin's Q/ROA

	Tobin's Q	**ROA**
Innovativeness (R&D/EMP)	-0.173** (-2.55)	-0.459**** (-4.24)
Innovativeness (Patents/R&D)	0.055 (1.21)	0.092 (1.03)

t-statistics in parentheses
*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

There were alternative forms of the dimension of EO (innovativeness) that were used in the Study. One alternative measure was the ratio of R&D to number of employees. This alternative measure of innovativeness had a significant negative effect on Tobin's Q at the 5% level (t=-2.55) and a significant negative effect on ROA at the 1% level (t=-4.24) in the full model whilst including time dummies. Whereas the measure of the number of patent applications to R&D was insignificant on both Tobin's Q and ROA as can be shown in table 7.36 above.

7.12 Chapter Conclusion

In this chapter, the hypotheses of the effect of EO and its dimensions on firm performance measures were tested in the sample of surviving firms. The fixed effect regression revealed that, after considering endogeneity or reverse causality, EO had an inverse U-shaped effect on ROA and Tobin's Q, thus supporting hypotheses *H2a* and *H2b*.

It was shown that innovativeness had a positive effect on long-term performance supporting hypothesis *H6b*. Proactiveness had a negative effect on long-term performance in support of hypothesis *H7b*. Finally, risk taking was shown to have a concave negative effect on short-term performance and a negative effect on the long-term performance, supporting hypotheses *H8a* and *H8b*, respectively.

The next section will outline the results from the failed firms' dataset. Then the next chapter 9 will present the results from the survival analysis.

Chapter 8

The Relationship of EO and Firm Performance among Failed Firms

8.1 Introduction to the Chapter

The following chapter will outline the results of the fixed effect regression models among failed firms. Specifically, the chapter will present the effects of each of the EO dimensions and the overall EO construct on firm performance measures (Tobin's Q and ROA). A sample of 401 failed firms from year 2000 until 2014 and a total of 1,863 observations were in the sample. The failed firms represent firms that have failed according to the delisting code of Compustat, in which failure could be due to merger and acquisitions, bankruptcy, liquidation, or privatisation (no longer filing with the SEC).

The chapter will sequentially outline the descriptive statistics of the predictor and dependent variables, the pre-analytical procedure of testing the fixed effect regression assumptions (which are the same as those in chapter 7), time-series figures of the predictor and dependent variables, the fixed effect regression results, effect of different values of EO on firm performance measures, and finally robustness checks of the fixed effect regression results.

This chapter aims to answer the following hypotheses. The hypotheses were outlined in the theoretical chapter 3. Thus, the hypotheses that were tested are:

8.1.1 Hypotheses: EO and Firm Performance

H3: The relationship between EO and (a) short-term and (b) long-term firm performance among failed firms is negative.

8.1.2 Hypotheses: EO Dimensions and Firm Performance

H6a: Innovativeness has a negative effect on short-term firm performance (ROA).
H6b: Innovativeness has a positive effect on long-term firm performance (Tobin's Q).
H7a: Proactiveness has a positive effect on short-term firm performance (ROA).
H7b: Proactiveness has a negative effect on long-term firm performance (Tobin's Q).
H8a: Risk taking has an inverse U-shaped effect on short-term firm performance (ROA).

H8b: Risk taking has a negative effect on long-term firm performance (Tobin's Q).

The next section will outline the descriptive statistics of the predictor and the dependent variables.

8.2 Descriptive Statistics for Predictor and Dependent Variables among Failed Firms

The following section will outline the descriptive statistics of each of the variables included in the regression models. Table 8.1 outlines the descriptive statistics, along with the skewness and kurtosis of the predictor variables. Table 8.2 presents the statistics of the dependent variables. The descriptive statistics include the mean, standard deviation, minimum, and maximum values of the variables.

Table 8.1: Descriptive Statistics for the Predictor Variables

Predictor Variables (winsorized)	**Mean**	**S.D.**	**Min**	**Max**	**Skewness**	**Kurtosis**
EO	0.8047	2.129	-28.809	8.749	-4.606	66.216
Innovativeness (R&D/total assets)	0.105	0.0728	0.0025	0.348	1.184	4.5803
Innovativeness (R&D/total employees)	0.034	0.030	0.0003	0.143	1.448	5.144
Innovativeness (number of patents/R&D)	0.337	0.48	0.0081	2.96	3.119	14.618
Proactiveness	-0.434	1.307	-7.117	0.976	-2.998	13.416
Risk Taking	0.033	0.016	0.0084	0.0807	1.129	3.8
Systematic Risk	1.42	0.672	0.107	3.248	0.631	3.286
Investment Opportunity	0.358	0.287	0.038	1.518	1.832	6.786
Firm size	3,845.859	9848.856	510	97,000	1.327	4.699
Firm age Listed	12.142	10.668	0	54	-0.51	2.696
Firm age Founded	25.523	16.274	4	79	1.266	4.39
Leverage	0.126	0.177	0	0.742	1.66	5.304
Liquidity	0.296	0.183	0.009	0.738	0.444	2.42

Table 8.2: Descriptive Statistics for the Dependent Variables

Dependent Variables	Mean	S.D.	Min	Max	Skewness	Kurtosis
Tobin's Q	1.5	1.274	-0.0087	7.755	2.375	10.356
ROA	-0.0549	0.226	-1.053	0.244	-2.629	10.717

The above tables represent the values of the variables when winsorized, that is the extreme values of the variables or outliers were transformed to the variables 1st and 99th percentiles (Miller & Le Breton-Miller, 2011). Furthermore, all variables were standardised (i.e. with a mean of zero and standard deviation of 1) before running the regression in STATA (e.g. Engelen et al., 2015).

In table 8.1, the mean value of EO was 0.8, which is higher than the mean value of EO among surviving firms (i.e. 0.26). Innovativeness on average was 10.5 %, which was higher than the average of innovativeness in the surviving firms dataset (i.e. 8.6 %). This means that on average failed firms were more innovative in comparison to the survived firms. This could be a response to avoid their failure, or could reflect the possibility that firms that were successfully innovating were then acquired. The mean proactiveness was – 43.4 %, whereas the mean of proactiveness among the surviving firms was -9%. Thus, this means that failed firms were being less proactive. It has been shown in the literature that retained earnings to total assets ratio is one of the most crucial indicators of financial distress. Thus, firms with less retained earnings are at a higher probability of being in a financial distress situation (Altman, 1968; Pindado et al., 2008). The average value of risk was 0.033, whereas among the surviving firms it was 0.025.

As for the control variables, the mean of firm size was 3,845 employees, which was less than the mean value of firm size in the surviving firms sample (i.e. 9,285). The failed firms were on average 12 years of age, which is less than the average value of the firms age among the surviving dataset (i.e. 17.6 years). The firm age that was used in the regression was the listing age, however, age based on the year the firms were founded did not make a difference in the regression results. The age of firms since founding on average was 25.5 years, which was lower than the founding age of surviving firms (i.e. 33.7 years). Leverage on average was 12.6 %, which was less than that among the surviving firms (i.e. 14 %). Liquidity was 29.6 % on average, which was more than the liquidity value among surviving firms being 27%. Investment opportunity on average was 35.8 %, whereas among the surviving firms it was 33.9 %. Lastly, systematic risk was 1.42 on average, which was higher than the value of systematic risk among surviving firms (i.e. 1.32).

In the table of the dependent variables 8.2, the average value of Tobin's Q was 1.5, whereas in the surviving firms sample it was 1.72. The failed firms still had a relatively high Tobin's Q. This means that the firms' stocks were overvalued or more expensive than the replacement cost of their assets. Thus, this could be a signal of the attractiveness of the firms to be acquired. Finally, the ROA mean value in the sample of firms was -5.4 %. The surviving firms had a mean ROA of 2.1 %. This indicates that firms in the failed firms sample were acquiring losses.

The next section will logically sequence the pre-analysis procedure for choosing the fixed effect regression (F-test, LM-test, and the Hausman test) as the appropriate regression and outline the tests (linearity, multicollinearity, heteroscedasticity, autocorrelation, and normality assumptions) of the fixed effect regression assumptions.

8.3 Pre-analysis Procedure among the Failed Firms

The assessment of the four regression models (effect of EO on Tobin's Q, effect of EO dimensions on Tobin's Q, effect of EO on ROA, and effect of EO dimensions on ROA) was done based on the F-test, the LM-test, the Hausman test, and the robust Hausman test to reveal whether the fixed effect regression was more appropriate than a simple OLS or a panel random effect regression as will be shown below (Kennedy, 2003; Wooldridge, 2015).

Then a pre-analysis procedure was conducted on the four separate fixed effect regression models (of combinations of the predictor variables EO/EO dimensions and the dependent variables Tobin's Q/ROA) before running the regression results. This was done to ensure that the relationships between each of the independent variables and the dependent variables was linear, that there are no issues of multicollinearity, and that the residuals from the regression are homoscedastic, uncorrelated, and normally distributed (Wooldridge, 2015). The sequencing of the testing of the regression assumptions are in accordance to Wooldridge (2015), in which the first assumption is the linearity assumption, and the last assumption is the normality assumption. Thus, the tests of the fixed effect regression involved linearity, multicollinearity, heteroscedasticity, autocorrelation and normality testing of the variables of the regression.

Finally, time dummies were also tested to determine whether they should be included in the regression models.

8.3.1 Testing the Appropriateness of the Fixed Effect Regression

The testing of the appropriateness of the fixed effect regression as will be shown below is done by using the F-test, LM-test, and followed by the Hausman tests.

Table 8.3: F-test of the Regression Models

Regression Models	F-test	Probability
Tobin's Q and EO	F(299, 1082) = 5.35	Prob>F= 0
Tobin's Q and EO Dimensions	F (299, 1080) = 5.4	Prob>F= 0
ROA and EO	F(299, 1086) = 4.58	Prob>F= 0
ROA and EO Dimensions	F (299, 1084) = 3.02	Prob>F= 0

The F-test examines the significance of the panel fixed effect regression. To test the fitness of the panel fixed effect regression, the F-test shows the probability that all coefficients in the fixed effect regression is equal to zero (i.e. null hypothesis of all the regression coefficients is zero).

In each of the four regression models, as shown in table 8.3, the F-test was significant or the null hypothesis was rejected, indicating that a panel fixed effect is better than a Pooled OLS regression. Furthermore, the F-test indicated that the regression was significant and thereby had strong explanatory power because without it the regression coefficients would be interpreted with caution.

After the F-test indicated that a panel fixed effect regression is better than a simple OLS regression, the LM-test was conducted to show whether a panel random effect is better than an OLS regression (Table 8.4).

Table 8.4: LM-test of the Regression Models

Regression Models	LM-test	Probability
Tobin's Q and EO	Chibar2(01) = 1007.48	Prob>chibar2= 0
Tobin's Q and EO Dimensions	Chibar2(01) = 922.73	Prob>chibar2= 0
ROA and EO	Chibar2(01) = 174.54	Prob>chibar2= 0
ROA and EO Dimensions	Chibar2(01) = 42.63	Prob>chibar2= 0

The results in table 8.4 showed that a panel random effect regression was better than a simple OLS.

The next section will outline the Hausman test results. After the LM-test and the previous F-test showed that a panel fixed effect regression was better than a pooled OLS regression, the Hausman test was conducted to investigate whether a panel fixed effect or a random effect regression was more appropriate.

Table 8.5: Hausman Test of the Regression Models

Regression Models	Hausman test	Probability
Tobin's Q and EO	Chi2(7) = 28.38	Prob>chi2= 0.0002
Tobin's Q and EO Dimensions	Chi2(9) = 54.98	Prob>chi2= 0
ROA and EO	Chi2(7) = 58.34	Prob>chi2= 0
ROA and EO Dimensions	Chi2(9) = 112.42	Prob>chi2= 0

According to the results of the Hausman test, as shown in table 8.5, the null hypothesis (under the null hypothesis the random effect regression is preferred and considered to be fully efficient) was rejected meaning that a panel fixed effect regression was more appropriate and consistent than the panel random effect regression.

The next section will outline the robust Hausman test results to validate that a fixed effect regression is better than a random effect regression.

Table 8.6: Robust Hausman Test of the Regression Models

Regression Models	Robust Hausman test	Probability
Tobin's Q and EO	Chi2(7)= 24.909	Prob>chi2= 0.0008
Tobin's Q and EO Dimensions	Chi2(9)=35.278	Prob>chi2= 0
ROA and EO	Chi2(7)= 43.991	Prob>chi2= 0
ROA and EO Dimensions	Chi2(9)=82.762	Prob>chi2= 0

As shown in table 8.6, the null hypothesis was rejected in the four regression equations, which reinforces that the fixed effect was more appropriate than the random effect regression. These results indicated that the fixed effect regression was more appropriate.

The next section will outline the testing of the panel fixed effect regression.

8.3.2 Testing the Assumptions of the Fixed Effect Regression

After revealing that a fixed effect regression fits the data, the next step was to test the assumptions of the fixed effect regression. The first assumption of the fixed effect regression to be tested was the linearity assumption, which was done through a joint Wald test. Followed by multicollinearity, heteroscedasticity, and autocorrelation tests.

8.3.2.1 Linearity Testing

The following section represents the linearity testing of the regressors with the dependent variables in each of the regressions. The linearity testing results from the regression of Tobin's Q, as the dependent variable, will be shown. Then the results from the regression of ROA, as the dependent variable, will be presented. Testing the linearity assumption of the control variables, with Tobin's Q and ROA as the dependent variables, is outlined first. Then, testing the linearity assumption of the main predictor variables (EO and its dimensions) is presented.

The linearity diagnostic tests will be complemented with residual scatterplots to have a visual inspection of the relationship of the predictor variables with the dependent variable(s) as a validation of the linearity test.

Below the linearity testing results of Tobin's Q, as the dependent variable, and the control variables regression will be outlined first as shown in table 8.7 and figure 8.1 and 8.2.

8.3.2.1.1 Linearity Testing of the Regression of Tobin's Q/ROA and the Control Variables

The following section outlines the linearity testing results of the control variables in each of the regressions of Tobin's Q and ROA, as the dependent variables. The section will first outline the results from the regression of Tobin's Q, followed by ROA as the dependent variable.

Table 8.7: Linearity Test of the Regression of Tobin's Q and Control variables

Regressors	**Linearity Test**
Systematic risk	Prob > F = 0.889
Investment opportunity	Prob > F = 0.047
Firm size (logged)	Prob > F = 0.526
Firm age (logged)	Prob > F = 0.045
Leverage	Prob > F = 0.0709
Liquidity	Prob > F = 0.138

Figure 8.1: Residual Figure of Tobin's Q and Investment Opportunity

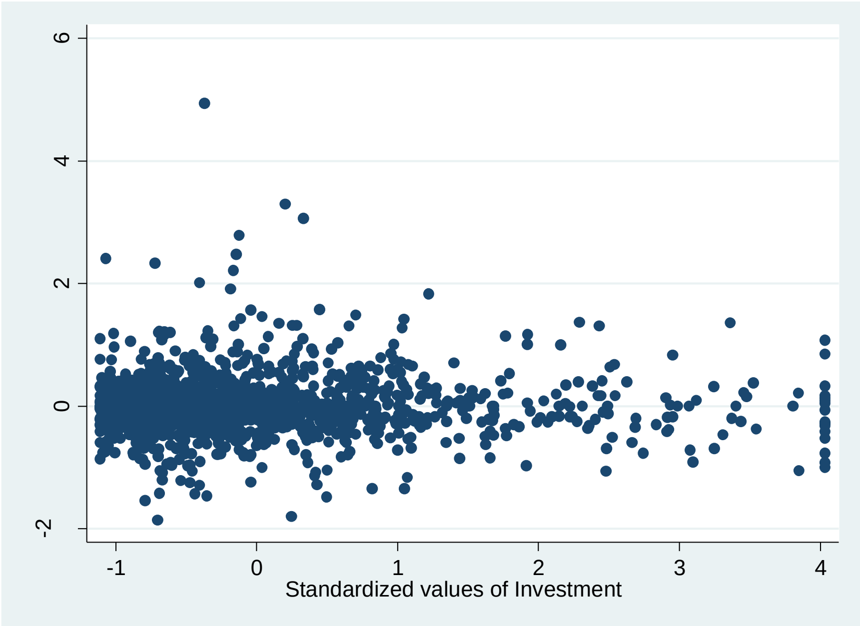
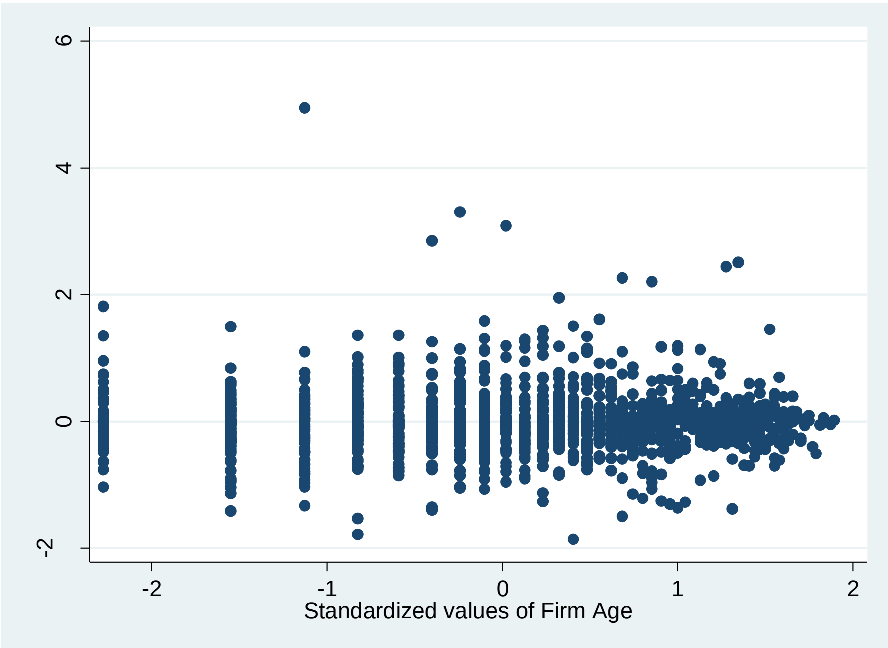


Figure 8.2: Residual Figure of Tobin's Q and Firm age



In table 8.7, the results of the linearity testing indicated that the control variables had a linear relationship with the dependent variable Tobin's Q (except for investment opportunity and the logged value of firm age). The linearity test of investment opportunity showed a P-value=0.047 and firm age showed a P=0.045, both close to P=0.05. To further examine the relationship between the two variables and Tobin's Q, the residual graph was requested. As shown above in figures 8.1 and 8.2 of the scatterplot of the residuals of the regression against standardised values of the tested variables, investment opportunity and firm age showed that they had a linear relationship with Tobin's Q, as the dependent variable, in which the residuals were centered around zero (Tarling, 2008). Thereby, the residual graphs provide evidence that the linearity assumption was satisfied.

The next table and scatterplots will show the linearity testing results of the regression of the control variables with ROA, as the dependent variable.

Table 8.8: Linearity Test of the Regression of ROA and Control variables

Regressors	**Linearity Test**
Systematic risk	Prob > F = 0.2403
Investment Opportunity	Prob > F = 0.006 Prob > F = 0.158
Firm size (logged)	Prob > F = 0.575
Firm age (logged)	Prob > F = 0
Leverage	Prob > F = 0.077
Liquidity	Prob > F = 0.961

Figure 8.3: Residual Figure of ROA and Firm age

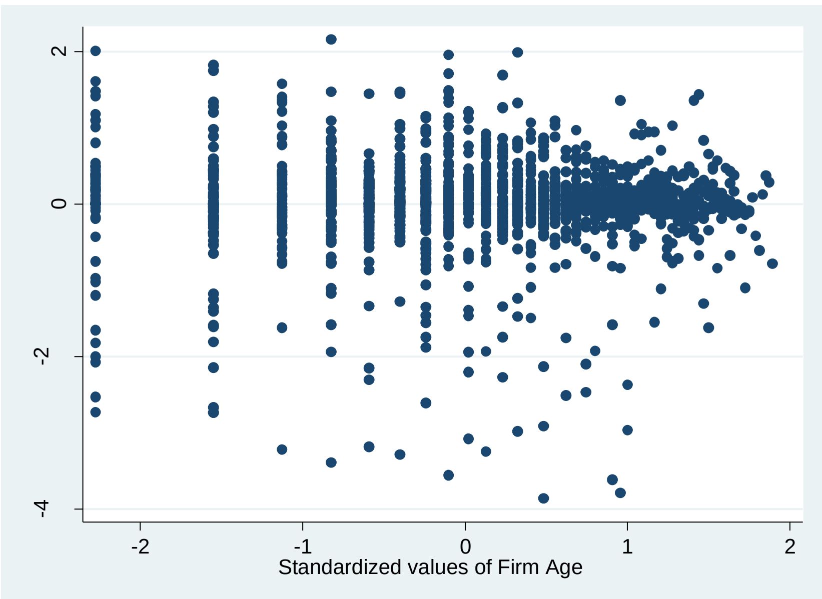


Figure 8.4: Residual Figure of ROA and Investment Opportunity

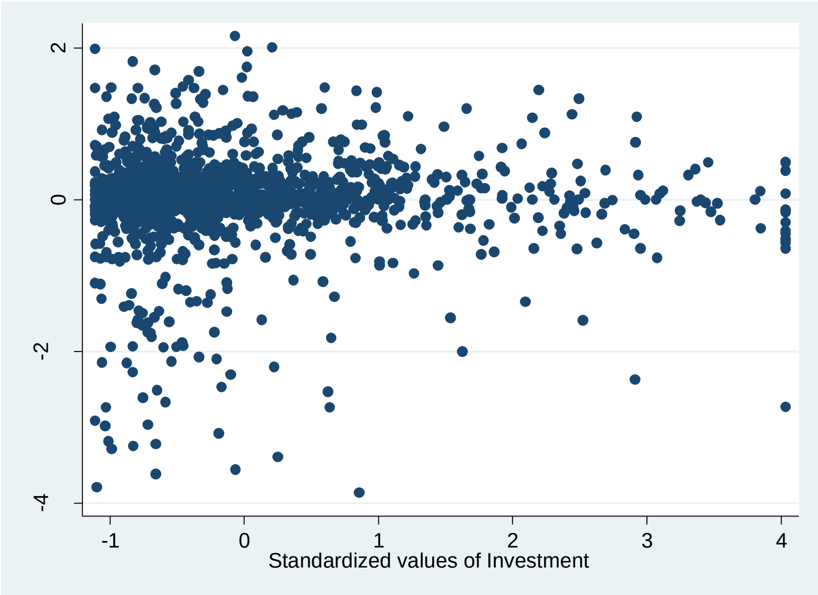
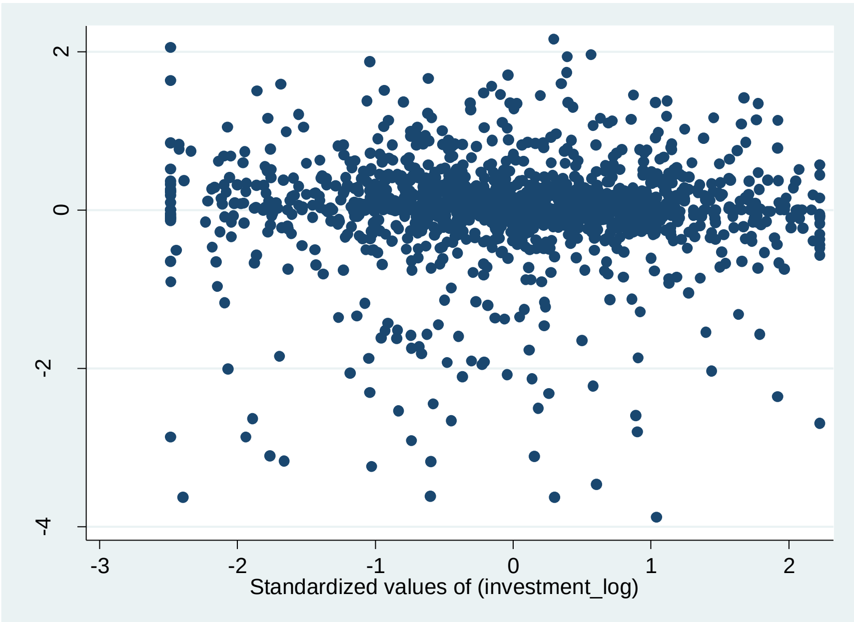


Figure 8.5: Residual Figure of ROA and Investment Opportunity Logged



In table 8.8, the results of the linearity testing indicated that the control variables had a linear relationship with the dependent variable ROA (except for investment opportunity and the logged value of firm age as well). However, as shown above in figure 8.3, firm age had a linear relationship with ROA, in which the figure was similar to the residual graph of firm age with Tobin's Q. As for investment opportunity, after the log transformation it passed the linearity testing and the difference could be noticed from figure 8.4 to 8.5. In figure 8.4, the residual plot showed a non-linear quadratic relationship in the form of an inverse U-shaped relationship, in which the residual graph had a concentration of more points above the zero line. The relationship improved to a linear relationship after the log transformation as shown in figure 8.5. Furthermore, after the log transformation the kurtosis value of investment opportunity improved from a value of 6.78 to a value of 2.85.

The next sections will outline the linearity testing results of the main predictor variable EO with each regression equation of Tobin's Q and ROA, as the dependent variables.

8.3.2.1.2 Linearity Testing of the Regression of Tobin's Q/ROA and the EO Construct

The following section represents the linearity test of the regression of EO as the predictor variable, with Tobin's Q and ROA as the dependent variables. The linearity test of EO in the regression of Tobin's Q as the dependent variable is outlined first followed by ROA.

Table 8.9: Linearity Test of the Regression of Tobin's Q/ROA and EO

Regressor: EO	**Linearity Test**
Dependent variable: Tobin's Q	Prob > F = 0.477
Dependent variable: ROA	Prob > F = 0.056

According to table 8.9, EO, as the predictor variable, was shown to pass the linearity testing, with both Tobin's Q and ROA as the dependent variables.
The next tables and scatterplots will show the linearity testing results of the regression of the EO dimensions, as the predictor variables, with Tobin's Q and ROA as the dependent variables.

8.3.2.1.3 Linearity Testing of the Regression of Tobin's Q/ROA and the EO Dimensions

The following represents the linearity testing of the EO dimensions as the predictor variables against Tobin's Q and ROA. The beginning of the section will outline the testing of the regressors against Tobin's Q followed by ROA.

Table 8.10: Linearity Test of the Regression of Tobin's Q and EO Dimensions

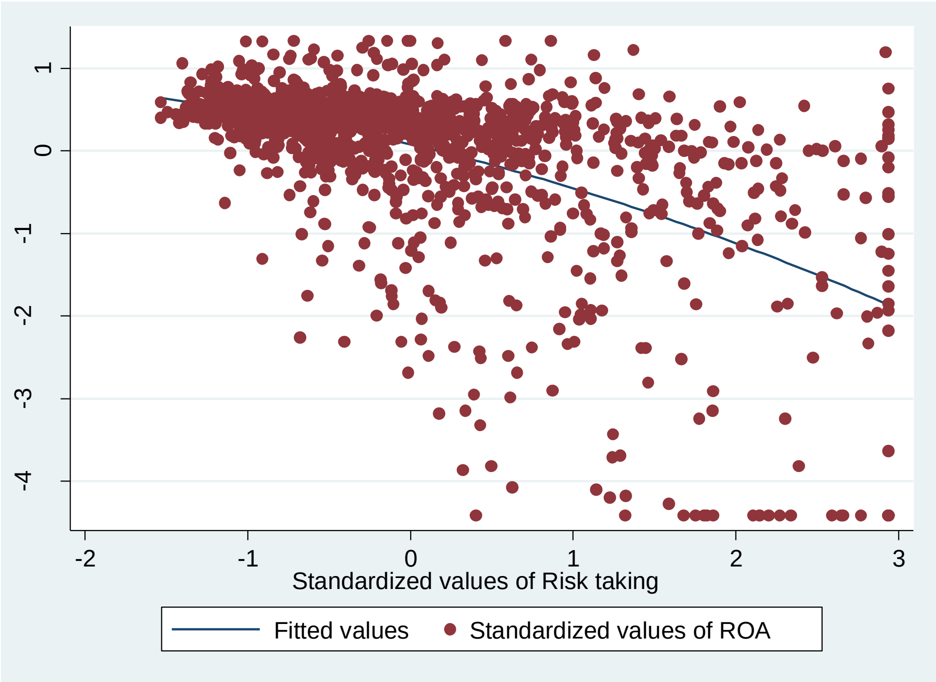
EO Dimensions	Linearity Test
Innovativeness	Prob > F = 0.496
Proactiveness	Prob > F = 0.098
Risk taking	Prob > F = 0.449

According to table 8.10, the separate EO dimensions were shown to pass the linearity testing with the dependent variable Tobin's Q. The following section will outline the linearity testing of the predictor variables, the EO dimensions, against ROA.

Table 8.11: Linearity Test of the Regression of ROA and EO Dimensions

EO Dimensions	Linearity Test	U-test to test the presence of a U shaped (H0=monotone)
Innovativeness	Prob > F = 0.089	N.A.
Proactiveness	Prob > F = 0	Extremum outside interval - trivial failure to reject H0
Risk taking	Prob > F = 0.0001	P>|t| = 0.451

Figure 8.6 of the Relationship of ROA and Risk taking



According to table 8.11, innovativeness passed the linearity test with ROA, but proactiveness did not. After conducting the U-test to test whether the relationship is quadratic, the results indicated that the relationship between ROA and proactiveness is monotonic. Thereby, instead proactiveness was log transformed. Furthermore, after the log transformation the kurtosis value of the proactiveness variable improved from a value of 13.4 to a value of 4.5.

As for the risk taking dimension of EO, it was shown by the linearity test in table 8.11 that the risk taking dimension of EO was not linear with the dependent variable ROA. Yet, after conducting the U-test, it was shown that the relationship was not significant; even though the squared term and its linear term were both significant at the 1 % level. According to figure 8.6, it was shown that the relationship between ROA and risk taking was a decreasing concave relationship similar to results in chapter 7. This provided support for hypothesis *H8a* on the effect of the risk taking dimension on short-term performance.

Thereby, when running the regression equation of the dependent variable ROA and risk taking dimension of EO as the main predictor variable, the regression equation was altered to include the squared term of risk taking only, which was generated by squaring the standardised variable.

After the linearity assumption was tested, the next step was to test for multicollinearity, which will be outlined in the next section.

8.3.2.2 Multicollinearity Testing

The second assumption is that there is no perfect linear relationship (i.e. multicollinearity) between the regressor variables. This assumption was tested through the VIF (variance inflation factor), which should not exceed 10. It was also tested through the regression correlation coefficients, which should not exceed 0.8 (Gujarati, 2003; Wooldridge, 2015). The regression correlation matrices were generated for the four regression equations.

8.3.2.2.1 Multicollinearity Test through VIF

The following section will test multicollinearity through the VIF. The multicollinearity testing will begin with outlining the VIF testing results of the regression of Tobin's Q, as the dependent variable, and EO as the predictor variable, following the results of Tobin's Q, as the dependent variable, and the EO dimensions, as the predictor variables.

The results of the regression of EO with the dependent variable ROA will be presented next followed by the results from the regression of the EO dimensions, as the predictor variables, with the dependent variable ROA.

Table 8.12: Variance Inflation Factor of the Regression of Tobin's Q and EO

Variables	VIF	1/VIF
Firm age	1.24	0.803
Liquidity	1.22	0.818
Firm size	1.22	0.819
Systematic risk	1.13	0.887
Leverage	1.12	0.892
EO	1.09	0.919
Investment Opportunity	1.06	0.943
Mean VIF	1.15	

According to table 8.12 above, the highest VIF value of running the regression of EO as the predictor variable against Tobin's Q, as the dependent variable, was firm age with a VIF of 1.24 and the mean VIF value was 1.15. These are far below the threshold for concern. Furthermore, the lowest tolerance value (tolerance value is inverse VIF) was 0.8, far above 0.1. This indicated that there were no issues of multicollinearity.

Table 8.13: Variance Inflation Factor of the Regression of Tobin's Q and EO Dimensions

Variables	VIF	1/VIF
Risk taking	1.54	0.649
Firm age	1.40	0.714
Innovativeness	1.33	0.754
Firm size	1.32	0.755
Proactiveness	1.32	0.757
Leverage	1.27	0.785
Liquidity	1.26	0.796
Systematic risk	1.20	0.835
Investment Opportunity	1.08	0.928
Mean VIF	1.3	

According to table 8.13, the highest VIF value of running the regression of EO dimensions as the predictor variables against Tobin's Q, as the dependent variable, was risk taking dimension of EO with a VIF of 1.54 and the mean VIF value was 1.3. The lowest tolerance value was 0.649, which is above 0.1. This indicated that there were no issues of multicollinearity.

Table 8.14: Variance Inflation Factor of the Regression of ROA and EO

Variables	**VIF**	**1/VIF**
Firm age	1.24	0.806
Liquidity	1.23	0.815
Firm size	1.22	0.818
Systematic risk	1.13	0.886
Leverage	1.12	0.8902
EO	1.09	0.9201
Investment Opportunity	1.05	0.955
Mean VIF	1.15	

According to table 8.14, the highest VIF value of running the regression of ROA, as the dependent variable, and EO, as the predictor variable, was firm age with a VIF of 1.24 and the mean VIF value was 1.15, similar to the regression of EO against the dependent variable Tobin's Q. This indicated that there were no issues of multicollinearity.

Table 8.15: Variance Inflation Factor of the Regression of ROA and EO Dimensions

Variables	**VIF**	**1/VIF**
Proactiveness	1.52	0.658
Firm age	1.39	0.719
Innovativeness	1.34	0.747
Leverage	1.31	0.76
Firm size	1.29	0.773
Liquidity	1.25	0.797
Risk taking squared	1.19	0.84
Systematic Risk	1.13	0.886
Investment Opportunity	1.06	0.943
Mean VIF	1.28	

According to table 8.15, the highest VIF value of running the regression of ROA, as the dependent variable, and EO dimensions, as the predictor variables, was proactiveness with a VIF of 1.52 and the mean VIF value was 1.28. Thus, there were no issues of multicollinearity.

The next section will outline the multicollinearity testing results of the regression coefficients following the same sequence of the VIF test results.

8.3.2.2.2 Multicollinearity Test through Correlation Matrix

The following section represents the correlation matrices of the estimated regression coefficients of each regression of Tobin's Q, as the dependent variable, followed by ROA, as the dependent variable.

Table 8.16: Correlation Matrix of the Coefficients of the Regression of Tobin's Q and EO

Variables	EO	SystematicRisk	FirmSize	FirmAge	Investment	Liquidity	Leverage
EO	1						
SystematicRisk	-0.184	1					
FirmSize	-0.074	-0.118	1				
FirmAge	0.451	0.035	-0.072	1			
Investment	-0.077	-0.036	-0.323	-0.075	1		
Liquidity	0.116	-0.1569	0.4377	0.098	0.1607	1	
Leverage	0.0569	0.1468	0.197	-0.116	0.015	-0.038	1

Table 8.17: Correlation Matrix of the Coefficients of the Regression of Tobin's Q and EO Dimensions

Variables	Innov	Proac	Risk	SysR	FirmSize	FirmAge	Investment	Liquidity	Leverage
Innov	1								
Proac	0.543	1							
Risk	-0.389	0.001	1						
SysR	-0.0051	-0.1909	-0.179	1					
FirmSize	-0.0217	-0.134	0.0548	-0.141	1				
FirmAge	0.162	0.5248	0.4558	0.0216	-0.129	1			
Investment	-0.1219	-0.122	-0.056	-0.0604	-0.301	-0.0898	1		
Liquidity	0.172	0.239	0.0782	-0.1369	0.381	0.128	0.102	1	
Leverage	0.472	0.5447	-0.3028	0.1004	-0.0204	0.0557	-0.054	0.0349	1

Note: innovativeness was abbreviated as 'innov', proactiveness as 'proac', and risk taking as 'risk', systematic risk as 'SysR'.

Table 8.18: Correlation Matrix of the coefficients of the Regression of ROA and EO

Variables	EO	SystematicRisk	FirmSize	FirmAge	Investment	Liquidity	Leverage
EO	1						
SystematicRisk	0.0136	1					
FirmSize	-0.138	0.029	1				
FirmAge	0.567	0.132	-0.316	1			
Investment	-0.183	-0.025	-0.0004	-0.0465	1		
Liquidity	0.272	-0.114	0.402	0.1634	0.2088	1	
Leverage	0.117	-0.319	-0.0992	-0.0885	-0.0123	0.1164	1

Table 8.19: Correlation Matrix of the Coefficients of the Regression of ROA and EO Dimensions

Variables	Innov	Proac	Risk^2	SysR	FirmSize	FirmAge	Investment	Liquidity	Leverage
Innov	1								
Proac	0.229	1							
Risk^2	0.129	0.011	1						
SysR	0.133	-0.055	0.273	1					
FirmSize	-0.105	-0.432	-0.176	0.356	1				
FirmAge	0.092	0.043	0.019	-0.014	-0.412	1			
Investment	0.078	-0.052	0.071	0.013	-0.096	0.077	1		
Liquidity	0.069	-0.175	-0.069	-0.154	0.191	0.179	0.216	1	
Leverage	0.032	0.436	-0.239	-0.306	-0.378	0.004	0.092	0.014	1

Note: innovativeness was abbreviated as 'innov', proactiveness as 'proac', and risk taking as 'risk', systematic risk as 'SysR'.

In table 8.16 above, which represents the regression of EO against the dependent variable Tobin's Q, the highest correlation was exhibited between firm age and EO being 0.45, followed by firm size and liquidity with a correlation coefficient of 0.437. The lowest correlation was among investment opportunity and leverage with a correlation coefficient of 0.015.

In table 8.17, which represents the correlation results of running the regression of the EO dimensions against the dependent variable Tobin's Q, the highest correlation was exhibited between leverage and proactiveness being 0.544, followed by innovativeness and proactiveness with a correlation coefficient of 0.543. Thus, because of the relatively high correlation between innovativeness and proactiveness, it is important to run regression models separately among the EO dimensions instead of including all of the EO dimensions in the same regression.

In table 8.18, representing the regression of EO against the dependent variable ROA, the highest correlation was among firm age and EO being 0.56, followed by firm size and firm age with a correlation coefficient of -0.3. The correlation between firm age and EO was higher than 0.5, however, it was still lower than 0.8. Furthermore, another proxy for firm age was used based on the founding date. It was shown that even with that proxy the correlation between EO and firm age was 0.51. The lowest correlation was among firm size and investment opportunity with a correlation of almost zero. Thereby, this indicated that there were no issues of multicollinearity.

In table 8.19, outlining the regression of the EO dimensions as the predictor variables against ROA, the highest correlation was between leverage and proactiveness being 0.436 followed by proactiveness and firm size with a correlation coefficient of -0.43, and finally firm size and firm age with a correlation of -0.41.

After multicollinearity was tested, heteroscedasticity of the error term was tested on the four regression models (Wooldridge, 2015).

8.3.2.3 Heteroscedasticity Testing

The assumption of constant variance of the residuals or the assumption of homoscedasticity was tested in each of the four regressions. If the null hypothesis was rejected, this indicates that the assumption of constant variance or homoscedasticity of the residuals of the fixed effect regression was not satisfied. Thereby, the robust clustered errors would be used instead of the standard errors.

Table 8.20: Heteroscedasticity Tests of the Regression Models

Regression Models	Heteroscedasticity tests	Probability
Tobin's Q and EO	chi2 (300) = 2.3e+34	Prob>chi2= 0
Tobin's Q and EO Dimensions	chi2 (300) = 4.6e+34	Prob>chi2= 0
ROA and EO	chi2 (300) = 3.8e+35	Prob>chi2= 0
ROA and EO Dimensions	chi2 (300) = 2.5e+36	Prob>chi2= 0

One must test for the homoscedasticity assumption of the error term in the regression. The modified Wald test was used after each of the four panel regression models as shown above in table 8.20. The tests were shown to reject the null hypothesis of homoscedasticity or constant variance of the idiosyncratic errors. This was a clear indication that heteroscedasticity was present. To remedy the biased OLS standard errors, robust and clustered errors were used (Cameron & Trivedi, 2010; Wooldridge, 2015).

After heteroscedasticity was tested, the next step was to test for autocorrelation of the error term in each of the regression models (Wooldridge, 2015).

8.3.2.4 Autocorrelation Testing

The following section represents autocorrelation testing as the fixed effect regression considers that there is no cross-sectional dependence of the error term. If the null hypothesis of the autocorrelation test was rejected, this indicates that there is cross-sectional dependence and that robust clustered errors should be used instead of the standard errors similar to the heteroscedasticity test.

Table 8.21: Autocorrelation Tests of the Regression Models

Regression Models	Heteroscedasticity tests	Probability
Tobin's Q and EO	F (1, 197) = 8.904	Prob > F = 0.0032
Tobin's Q and EO Dimensions	F (1, 197) =12.137	Prob > F = 0.0006
ROA and EO	F (1, 198) =12.840	Prob > F = 0.0004
ROA and EO Dimensions	F (1, 198) = 42.566	Prob > F = 0

To test for within panel serial correlation, the Wooldridge test for autocorrelation was run for each of the four regression models as shown above in table 8.21. The null hypothesis considers that there is no serial correlation. It is shown that the null hypothesis was rejected. To solve the issue of autocorrelation of the error term, adjustment should be made by requesting robust clustered errors as well (Cameron & Trivedi, 2010). Thus, clustering at the firm level was done to account for the autocorrelation among the sample of firms.

The last assumption of the fixed effect regression to be tested was the normality assumption (Wooldridge, 2015), which will be shown in the below section.

8.3.2.5 Normality Testing

This section represents the normality testing of the regressions. To test for the normality of the residuals, the representation of the residuals was used as shown in figures 8.7, 8.8, 8.9, and 8.10 below. The fixed effect regression was run and then the residuals were generated. Consequently, the kernel density or the graphic representation of the distribution of the residuals was derived. The figures show the distribution of the residuals in comparison to a normal distribution.

Figure 8.7: Normality Test of the Regression of Tobin's Q and EO

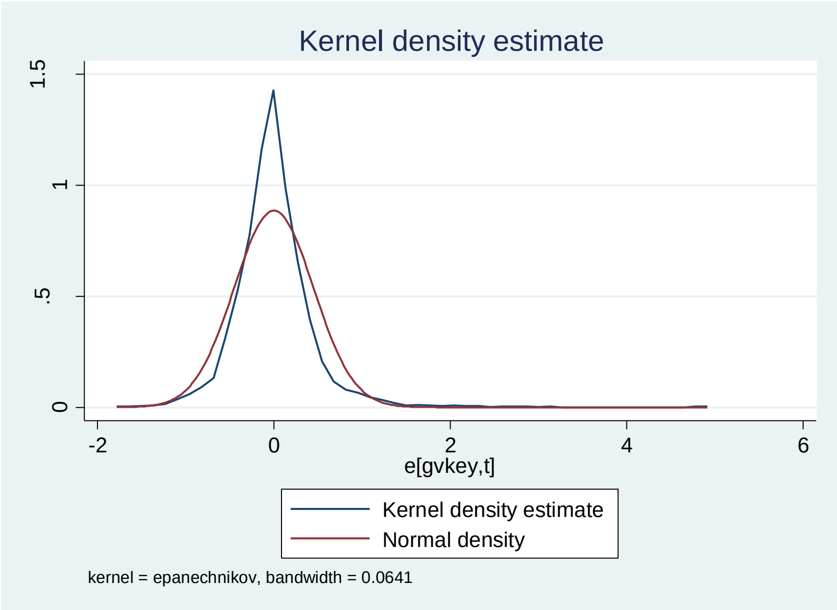


Figure 8.8: Normality Test of the Regression of Tobin's Q and EO Dimensions

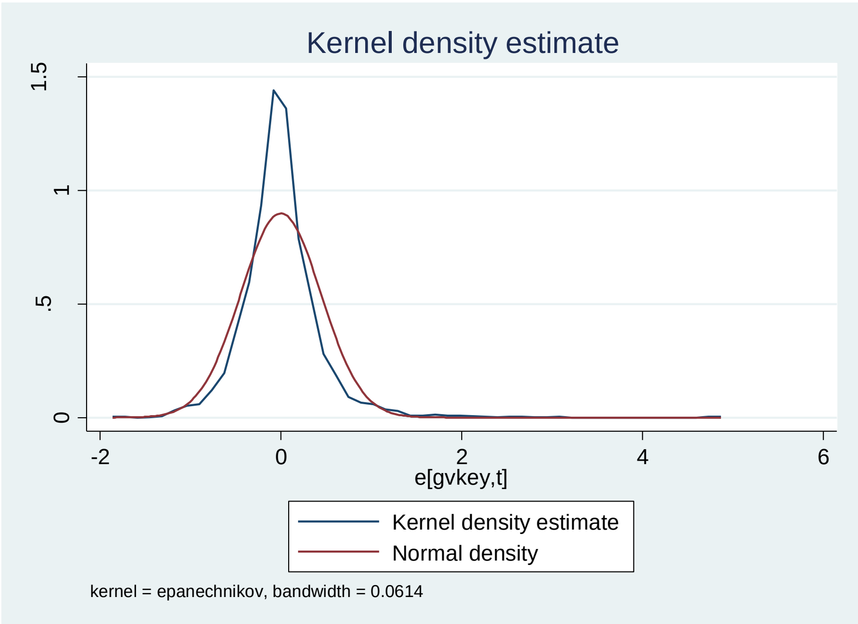


Figure 8.9: Normality Test of the Regression of ROA and EO

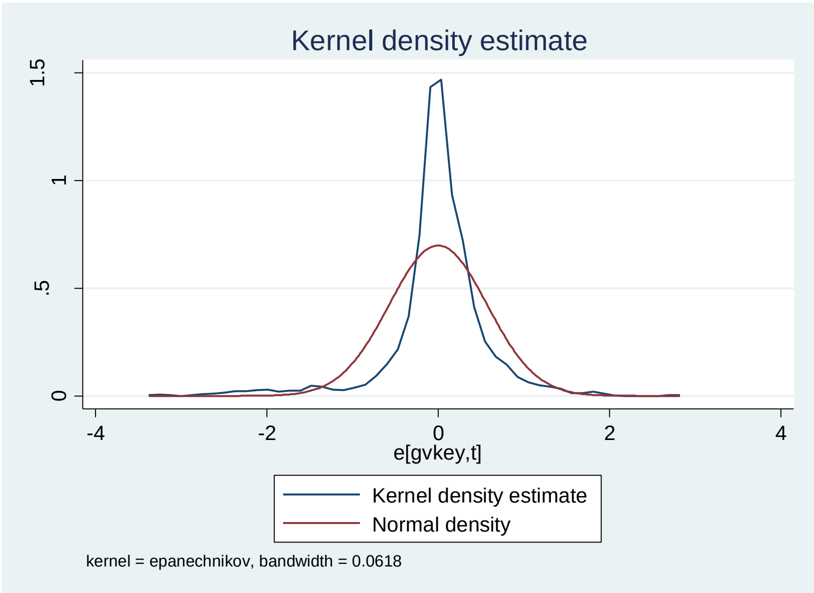
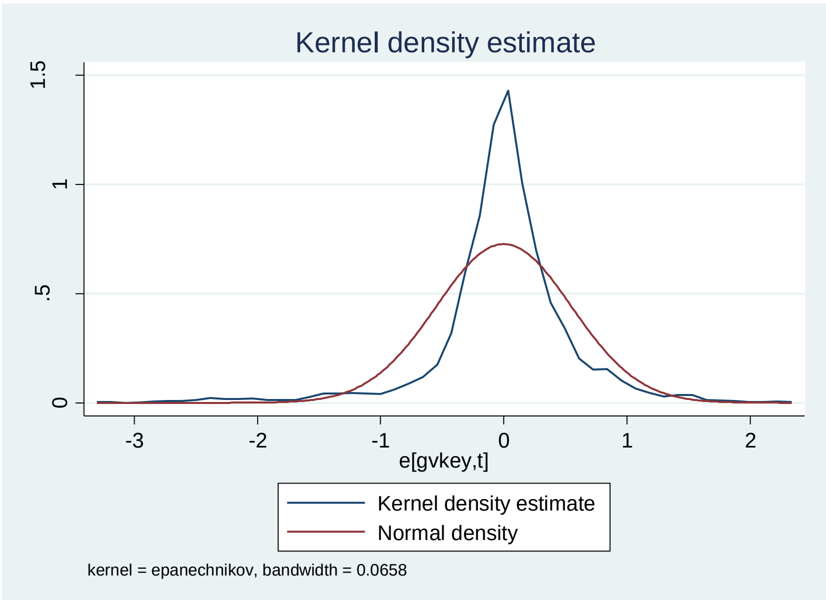


Figure 8.10: Normality Test of the Regression of ROA and EO Dimensions



Similar to chapter 7, there was an issue of non-normality with the residuals of each of the regression models, yet there was a pressing matter of multicollinearity, heteroscedasticity, and autocorrelation (Wooldridge, 2015). These were tested in earlier sections . Furthermore, bootstrapping was used as a robustness test, as it is a resampling method that does not require the normality assumption of the distribution of the residuals (Cameron & Trivedi, 2010; Longhi & Nandi, 2014).

Bootstrapping test showed that the regression results did not differ. The bootstrapping was done by instructing 500 bootstrap replications based upon the cluster of firms (Alejo et al., 2015).

After the fixed effect regression was found to be appropriate and the regression assumptions were tested, the next step was to test whether the time effect was significant in each of the regression models. Thus, the following section will outline the test of the time effect in each of the regression models.

8.4 Test of the Time Effect among Failed firms

To test whether time dummies are necessary to include in the regression, the significance of the time effect was tested in the four regression models. If the probability of the test that all the time dummies are jointly equal to zero, then one fails to reject the null hypothesis.

Table 8.22: Testing of the Time Effect of the Regression Models

Regression Models	F-test	Probability
Tobin's Q and EO	F (12, 299) = 18.59	Prob>chi2= 0
Tobin's Q and EO Dimensions	F (12, 299) = 18.01	Prob>chi2= 0
ROA and EO	F (12, 299) = 1.33	Prob>chi2= 0.2028
ROA and EO Dimensions	F (12, 299) = 2.6	Prob>chi2= 0.0026

Based on the results shown in table 8.22, the null hypothesis (of insignificant time effect) was rejected in three of the four regression models. Thereby, time dummies should be included in the fixed effect regression excluding one-time dummy in the regression models. Thus, the fixed effect estimator would be a two-way fixed estimator accounting for both fixed firm and time effects in the regression models. However, in the regression of ROA and EO, the time dummies failed to show a significant effect on ROA.

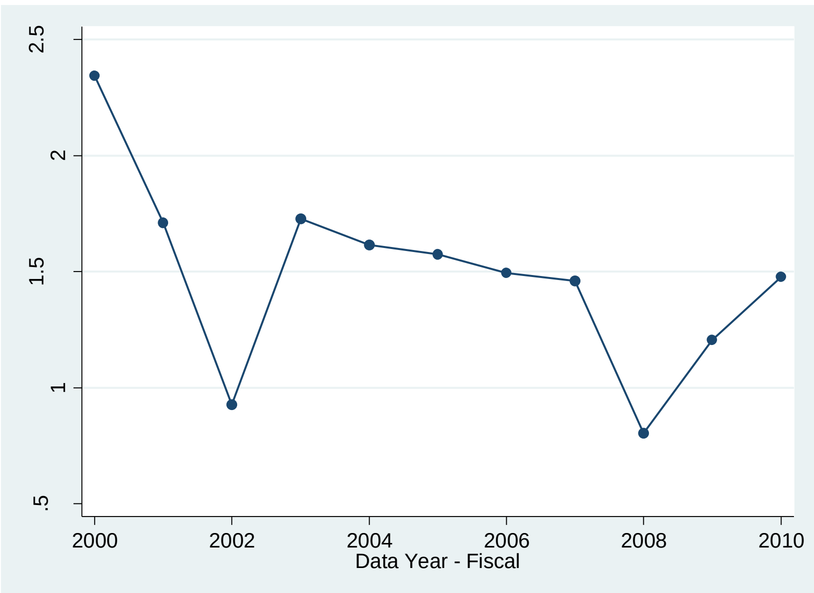
The following actions (or tests) described above are necessary before running the fixed effect regression as one cannot run a regression without testing that its assumptions are fulfilled, and the econometric model is correct. A fixed effect regression might be desirable as it controls for variables that are fixed over time but might not be appropriate according to the Hausman test. Even if a fixed effect regression was shown to be appropriate, it is vital that one tests for the assumptions of the regression before conducting the results (Wooldridge, 2015).

The next section will present the time-series figures of the mean values of the main predictor and dependent variables among the sample of failed firms. It is of relevance to examine among the sample of failed firms the average fluctuations of the variables from the pre-crisis to the post-crisis period, as this is a longitudinal timeframe Study. Thus, the next section will start with the graphic representation of the mean value changes in the main dependent variables Tobin's Q and ROA, followed by EO and its dimensions, the predictor variables, across the timeframe.

8.5 Time-series Figures of the Main Variables among Failed Firms

This section shows the time series figures from the pre-crisis to the post-crisis period of the fluctuations of the mean values of the main predictor variables (EO and its dimensions) and dependent variables (Tobin's Q and ROA) in the sample of failed firms across the Study's timeframe.

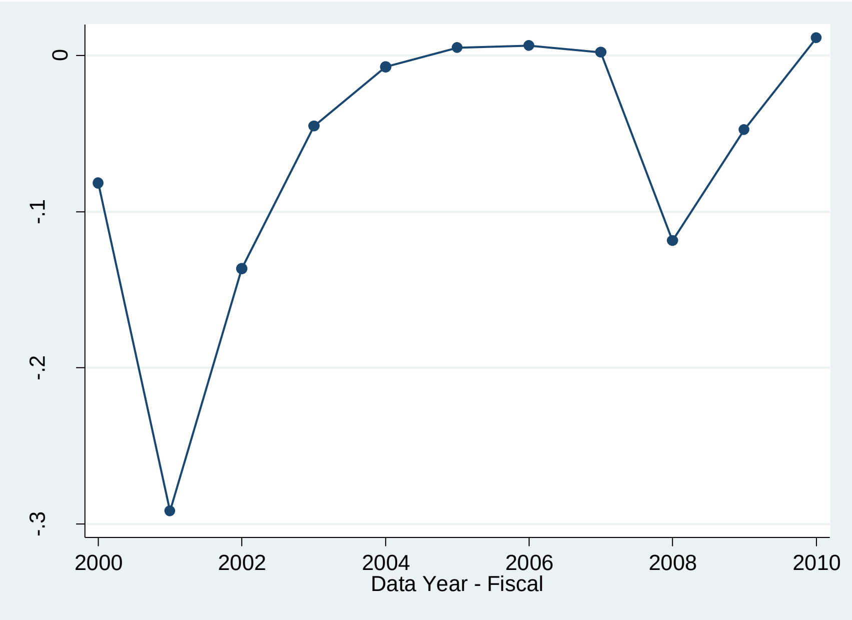
Figure 8.11: Mean Tobin's Q Time-Series



The above figure 8.11 shows the time variation from year 2000 until 2010 of the dependent variable Tobin's Q. The mean value of Tobin's Q decreased significantly from year 2000 until 2002, in which it reached lower than 1. By the time of the financial crisis (year 2008), it decreased to a lower point than it did in year 2002 to less than 1. Then it increased slightly up to year 2010.

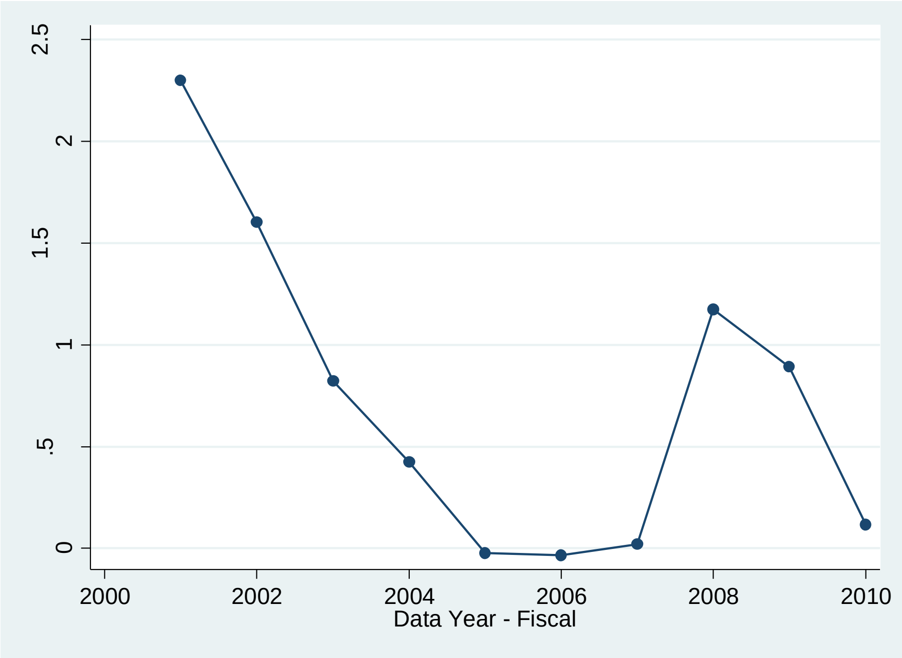
The Tobin's Q figure among the surviving firms in chapter 7 also had its lowest point in year 2008, in which Tobin's Q decreased to less than 1. This indicates that during the financial crisis both surviving and failed firms had higher cost of replacement of their assets in comparison to their market value.

Figure 8.12: Mean ROA Time-Series



The above figure 8.12 shows the time variation of dependent variable ROA. As shown, ROA decreased significantly from year 2000 until 2001. Then it decreased from year 2006 until 2008. Then it increased up until year 2010. The results are also similar to those in chapter 7, in which ROA had its lowest point in year 2001, followed by year 2008.

Figure 8.13: Mean EO Time-Series

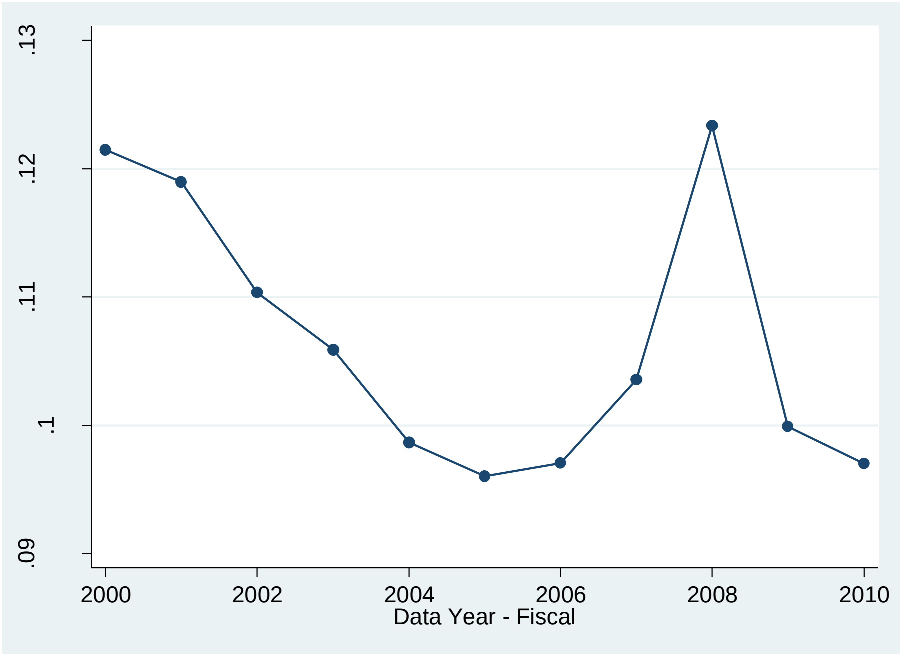


The figure 8.13 above shows that similar to the time-series figure of EO among the surviving firms, the mean value of EO among the failed firms was not consistent across time. EO was highest in year 2001, but it decreased significantly until 2006. From 2006 an increase in EO was observed which was sustained until the year 2008. In 2008, EO was relatively high similar to 2001. Then it decreased from 2008 until year 2010. This means that during the financial crisis, EO was relatively high. Interestingly EO dropped suddenly after the financial crisis (2008).

The sample of firms that failed due to merger and acquisition were excluded and the sample of firms that failed due to bankruptcy, liquidity, or privatisation also showed a similar time-series figure to the above figure 8.13.

The time-series figure of EO among the failed firms was similar to the figure of EO among surviving firms in chapter 7, in which it was shown that EO among the surviving firms was highest in year 2001; yet it was at its second highest peak during the financial crisis, after which it decreased in year 2010. Contrastingly, the surviving firms witnessed a slight increase in EO after year 2010. The time-series figures of EO in the sample of surviving and failed firms revealed that EO was not the same across the timeframe of the Study, and that there was a sudden drop in EO after the financial crisis. The increase of EO during the financial crisis could entail that firms sought solace by increasing their EO. When faced with the risk of failure, firms were more likely to increase their reliance on risky entrepreneurial behaviours, in accordance with organisational learning theory and prospect theory (March 1991; Swift, 2016).

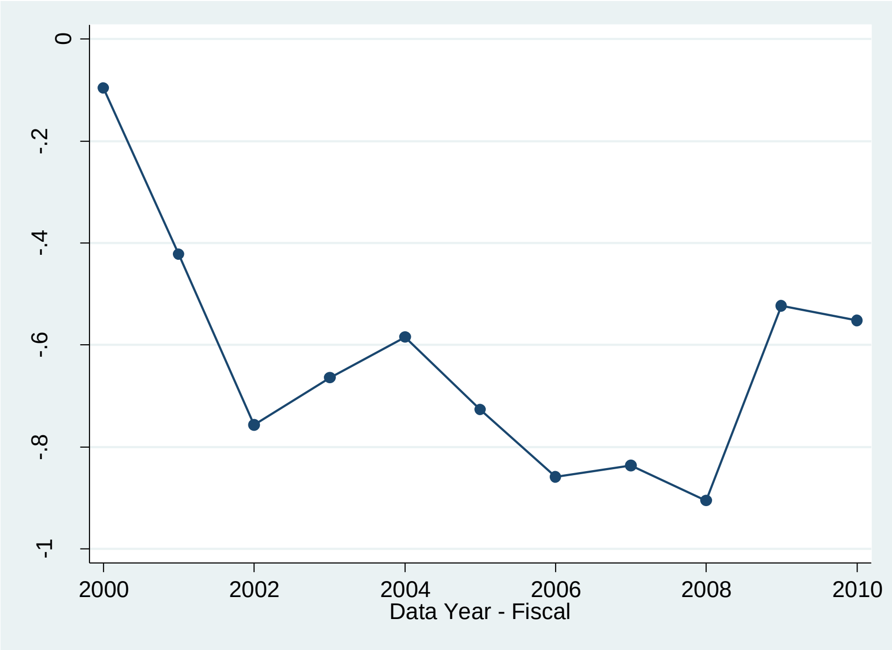
Figure 8.14: Mean Innovativeness Time-Series



Innovativeness as shown in figure 8.14 above, was significantly high in year 2000 until it decreased in the year 2004, but increased significantly from year 2005 until 2008. In 2008, it was even at a higher point than the year 2000. However, from year 2008 until 2010, it decreased significantly. Thus, during the pre-crisis period (two years prior to 2008), innovativeness was increasing until it reached its highest point during the crisis. The post-crisis period evidenced a significant drop in innovativeness.

In the surviving firms dataset in chapter 7, innovativeness was at its highest peak during the year 2001, and followed by 2012. The third highest peak was during 2008. However, among the failed firms as shown in the above figure 8.14, the highest peak was during the financial crisis (2008). This might suggest that firms may have sought to increase innovation, but possibly they could not sustain it or reverted to their old strategy after the period subsided (March, 2006).

Figure 8.15: Mean Proactiveness Time-Series

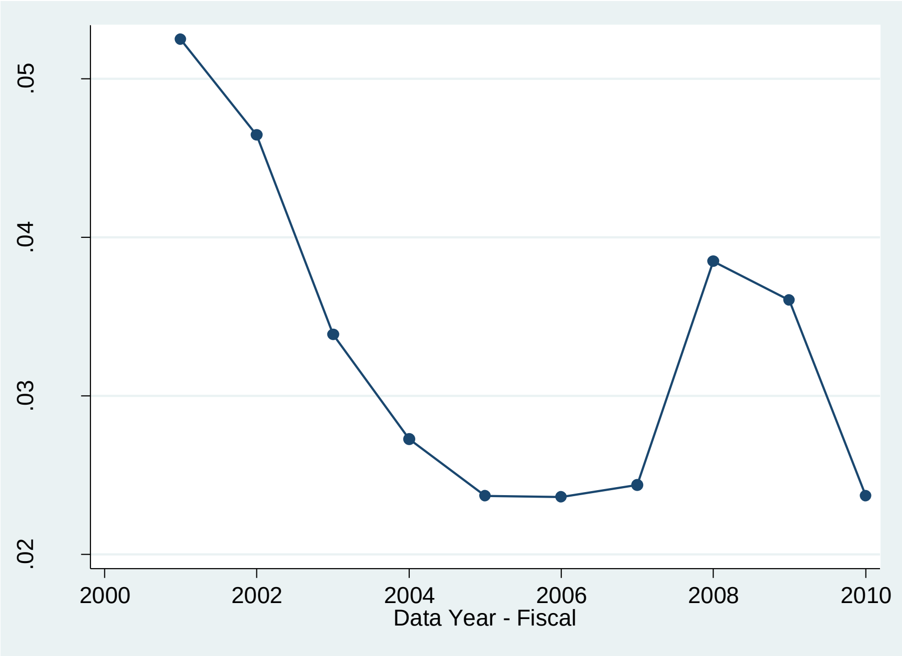


Proactiveness, as shown in figure 8.15 above, was at the highest point in year 2000. It decreased significantly from year 2000 until 2002. From year 2002 until 2004 it increased slightly. From year 2004 until 2006, it decreased to its second lowest point. From 2006 until 2008, it decreased to its lowest point in 2008. After 2008, proactiveness increased.

The above figure is also similar to the time-series plot of proactiveness among the surviving firms, which was at its highest point in year 2000, but then decreased significantly to its lowest point in year 2009.

This means that in opposition to innovativeness and EO, during the pre-crisis period proactiveness was decreasing until it reached the lowest point during year 2008. In the post-crisis period, it started to increase. Thus, this reinforces the independence of the EO dimensions and is in support of the multi-dimensionality conceptualisation of EO (Lumpkin & Dess, 1996) and reveals the dynamic nature of EO.

Figure 8.16: Mean Risk Taking Time-Series



Risk taking, as shown in figure 8.16 above, was at the highest point in year 2001. It decreased significantly from 2000 until 2006. From 2006 until 2008, it increased significantly until it reached its peak during year 2008. From 2008 until 2010 it decreased significantly. This means that during the pre-crisis period (two years prior to 2008), it was increasing until year 2008. During the post-crisis period, it started to decrease. The above figure of risk taking is also similar to the figure of risk taking among the surviving firms, which also had its highest peak in year 2001, and its second highest peak in year 2008.

The time-series figure of risk taking is similar to innovativeness and EO. This means that innovativeness and risk taking might have shared aspects, rather than proactiveness and innovativeness as some of the literature has argued (e.g. Anderson et al., 2015). This entails new theoretical and conceptual insights into the different effect of proactiveness from innovativeness and risk taking dimensions that was shown among the samples of surviving and failed firms.

Before outlining the main regression results in section 8.7, the next section 8.6 will outline the importance of using the adjusted R-squared value when reporting the main regression results.

8.6 Fitness (Explanatory Power) of the Fixed Effect Regression among Failed Firms

The adjusted R-squared is presented for each of the four regression models by running an OLS regression with firm, industry, and time dummies since the fixed effect R-squared does not account and cancels effects that are fixed such as industry and firm effects.

This section will begin with outlining the adjusted R-squared of each of the regression models in table 8.23 below. As stated earlier, the adjusted R-squared should be reported since the R-squared is biased and it increases with the number of predictors and number of firms included and this will be shown below. This reinforces the use of the adjusted R-squared in the main regression results. Thus, in section 8.7, the adjusted R-squared is reported instead of the R-squared value. The change in the adjusted R-squared, in section 8.7, can be seen when comparing the different regression models.

Even though the adjusted R-squared will be presented in the main regression results as well, it is important to reveal the discrepancy between R-squared and the adjusted R-squared and the importance of using the adjusted R-squared before outlining the main regression results similar to chapter 7.

Table 8.23: Adjusted R-squared value of the Regression Models

Regression Models	R-Squared	Adjusted R-Squared
Tobin's Q and EO	0.6745	0.577
Tobin's Q and EO Dimensions	0.684	0.589
ROA and EO	0.67	0.5719
ROA and EO Dimensions	0.701	0.612

According to table 8.23 above, the adjusted R-squared value of the regression of Tobin's Q, as the dependent variable, and EO/EO dimensions, as the predictor variables, in the full models of dummies for industry, firm, and time was 0.58 (the

R-squared value was much higher, i.e. 0.67). Thus, 58% of the changes in Tobin's Q was explained by the variables in the full model. In chapter 7, which outlines the regression results of the surviving firms, the regression of EO and its dimensions against the dependent variable Tobin's Q had a higher explanatory power (i.e. 0.68). The adjusted R-squared of the regression of ROA, as the dependent variable, and EO, as the predictor variable, was 0.57 and showed that 57% of the changes in ROA was explained by the regression, whereas in the surviving firms' dataset it was 0.5. The regression of the EO dimensions against ROA as the dependent variable adjusted R-squared was 0.61, whereas in the surviving firms dataset it was 0.53.

The next section will outline the main regression results of the regression models starting with Tobin's Q as the dependent variable and then followed by ROA, as the dependent variable. There are two tables, in which the first table outlines the results of the main regression with Tobin's Q as the dependent variable, and the second table with ROA as the dependent variable.

8.7 Regression Analysis Results among Failed Firms

The fixed effect regression was used (with robust clustered standard errors) to examine the relationship between Tobin's Q/ROA, as the dependent variables, and the main variables of the EO and its dimensions, as the predictor variables.

The below tables 8.24 and 8.25 represent the results of the fixed effect regression of each of the dependent variables (Tobin's Q and ROA) with the explanatory variables. The different models of the regression results are outlined in the below tables.

Model 1 shows the relationship between the dependent variables and the controls only. Model 2 shows the relationship between the dependent variables and EO. Model 3 shows the relationship between the dependent variables and the main predictor variables in separate models. Model 3a outlines the results of innovativeness only, model 3b shows the results of proactiveness, and finally model 3c outlines the results of the risk taking dimension only.

It is important to reiterate the importance of splitting the EO dimensions since proactiveness and innovativeness were shown to have a relatively high correlation, with a correlation above 0.5 in the regression of Tobin's Q as the dependent variable, and a correlation of the value 0.4 in the regression of ROA as the dependent variable.

The first table 8.24 outlines the results of the effects of EO and its dimensions on Tobin's Q as the dependent variable including the time dummies in the four regression models.

The second table 8.25 outlines the results of the regression of the effects of EO and its dimensions on ROA. In table 8.25, model 2, which outlines the effect of EO on ROA, the time dummies are absent due to the insignificant results of the time dummies in the regression, as was shown in section 8.4. Thereby, no time dummies were needed to be included in the regression of ROA and EO.

The last table 8.26 shows the summary results of the regression models.

In the below tables 8.24 and 8.25, the coefficients are under the column B and the robust standard errors are labelled as RSE. The t-values are in parentheses, under the coefficients. Innovativeness has been abbreviated as 'Innov', proactiveness as 'proac', risk taking as 'risk', systematic risk as 'sys risk'. Furthermore, the number of observations with the cluster of firms were abbreviated as N, the adjusted R-squared as Adj. $R^{\wedge 2}$, and the F-test as F.

Table 8.24: Fixed Effect Regression Results of the Effects of EO and its Dimensions on Tobin's Q with Time Dummies

Tobin's Q	Model 1		Model 2		Model 3a		Model 3b		Model 3c	
Predictors	B	RSE	B	RSE	B	RSE	B	RSE	B	RSE
Sys Risk	0.084*** (3.07)	0.027	0.096*** (3.32)	0.029	0.086*** (3.14)	0.0275	0.086*** (3.19)	0.027	0.097*** (3.31)	0.029
Investment Opportunity	0.0817**** (3.61)	0.022	0.082**** (3.55)	0.023	0.085**** (3.76)	0.0226	0.084**** (3.58)	0.023	0.084**** (3.66)	0.023
Firm size	-0.15* (-1.66)	0.095	-0.131 (-1.32)	0.098	-0.135 (-1.41)	0.096	-0.032 (-0.32)	0.1003	-0.172* (-1.71)	0.1006
Firm age	0.086 (1.05)	0.082	0.044 (0.51)	0.086	0.089 (1.08)	0.082	0.033 (0.39)	0.085	0.052 (0.62)	0.084
Leverage	-0.058* (-1.84)	0.031	-0.054 (-1.65)	0.032	-0.049 (-1.62)	0.03	-0.093*** (-2.89)	0.032	-0.04 (-1.2)	0.035
Liquidity	-0.014 (-0.38)	0.037	-0.013 (-0.34)	0.039	-0.003 (-0.08)	0.037	-0.007 (-0.19)	0.037	-0.014 (-0.37)	0.039
EO			-0.029** (-2.29)	0.012						
Innov					0.102** (2.29)	0.045				
Proac							-0.185*** (-3.37)	0.054		
Risk									-0.057 (-1.52)	0.037
Constant	0.253*** (3.31)	0.076	0.284*** (3.5)	0.081	0.248 (3.24)	0.076	0.237 (3.12)	0.076	0.296 (3.5)	0.084
Time	Yes		Yes		Yes		Yes		Yes	
Adj. R^2	0.575		0.577		0.578		0.584		0.574	
N	1430(301)		1389(300)		1430(301)		1423(301)		1396(300)	
F	21.14		19.72		20.01		20.35		19.72	
Prob(F)	0		0		0		0		0	

Note: t-statistics in parentheses. *p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

Table 8.24 above outlines the results of the regression models whilst including the time dummies, in which Tobin's Q is the dependent variable under investigation. The regression models in the above table tested for *H3b* on the effect of EO on long-term performance among failed firms and for *H6b*, *H7b*, and *H8b* on the effect of the EO dimensions (innovativeness, proactiveness, risk taking) on long-term performance. Model 2, which includes EO tested for hypothesis *H3b*. Model 3a, which includes innovativeness, tested for hypothesis *H6b*. Model 3b, which includes proactiveness, tested for hypothesis *H7b*. Model 3c, which includes risk taking, tested for hypothesis *H8b*.

In model 1, which includes the control variables, systematic risk (B=0.084) and investment opportunity (B=0.08) had a significant positive effect on Tobin's Q at the 1% level. The regression with the time dummies explained 57.5 % of the changes in Tobin's Q.

Model 2 includes EO and revealed that it had a significant negative effect on Tobin's Q at the 5% level (t=-2.29) confirming hypothesis *H3b*. Systematic risk and investment opportunity had a positive effect significant at the 1% level. The regression explained 57.7 % of the changes in Tobin's Q.

Model 3a, which includes only innovativeness, revealed that innovativeness (t=2.29) had a significant positive effect on Tobin's Q at the 5% level confirming hypothesis *H6b*. Systematic risk and investment opportunity had a significant positive effect at the 1 % level. The adjusted R-squared was 0.578, which means that innovativeness explained 57.8 % of the changes in Tobin's Q.

Model 3b, which includes proactiveness, showed that proactiveness (t=-3.37) had a significant negative effect at the 1 % level confirming hypothesis *H7b*. Systematic risk and investment opportunity had a significant positive effect at the 1 % level. Leverage (t=-2.89) had a significant negative effect at the 1 % level. The regression explained 58.4 % of the changes in Tobin's Q.

Model 3c, which includes risk taking, revealed that risk taking had an insignificant effect on Tobin's Q, not supporting hypothesis *H8b*. However, in the regression excluding the time dummies revealed that risk taking had a significant negative effect on Tobin's Q at the 1% level (t=-4.81). Systematic risk and investment opportunity had a significant positive effect at the 1 % level. The regression explained 57.4 % of the changes in Tobin's Q.

Table 8.25: Fixed Effect Regression Results of the Effects of EO and its Dimensions on ROA with Time Dummies

ROA	Model 1		Model 2		Model 3a		Model 3b		Model 3c	
Predictors	B	RSE	B	RSE	B	RSE	B	RSE	B	RSE
Sys Risk	-0.0928* (-1.84)	0.0505	0.028 (0.86)	0.032	-0.108** (-2.57)	0.042	-0.096** (-2.09)	0.046	-0.073 (-1.47)	0.026
Investment Opportunity	0.125**** (3.89)	0.032	0.1006*** (3.36)	0.029	0.103**** (3.79)	0.027	0.109**** (4.21)	0.026	0.107*** (3.35)	0.032
Firm size	-0.172 (-1.25)	0.138	0.032 (0.31)	0.105	-0.347*** (-2.9)	0.119	-0.628**** (-4.1)	0.153	-0.131 (-0.9)	0.145
Firm age	0.616**** (4.57)	0.134	0.166* (1.66)	0.1001	0.6004**** (4.91)	0.122	0.668**** (4.63)	0.144	0.454**** (3.52)	0.129
Leverage	-0.213**** (-3.93)	0.054	-0.207**** (-4.1)	0.0506	-0.275**** (-5.73)	0.048	-0.069 (-1.21)	0.057	-0.156*** (-2.79)	0.056
Liquidity	0.125** (2.43)	0.051	0.093* (1.86)	0.049	0.045 (1.02)	0.0449	0.0816* (1.69)	0.048	0.141*** (2.74)	0.051
EO			-0.27**** (-5.58)	0.049						
Innov					-0.745**** (-9.6)	0.077				
Proac							0.79**** (6.98)	0.113		
Risk^2									-0.131**** (-5.05)	0.026
Constant	-0.004 (-0.06)	0.0803	0.22**** (5.17)	0.042	0.023 (0.3)	0.078	-0.096 (-1.16)	0.082	0.145* (1.79)	0.081
Time dummies	Yes		No		Yes		Yes		Yes	
Adj. R^2	0.48		0.57		0.583		0.55		0.508	
N	1434 (301)		1393(300)		1434 (301)		1427(301)		1400 (300)	
F	6.96		12.4		12.51		9.79		6.79	
Prob(F)	0		0		0		0		0	

Note: t-statistics in parentheses. *p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

Table 8.25 above outlines the results of the regression models, in which ROA is the dependent variable and time dummies are included. The regression models in this table tested for *H3a* on the effect of EO on short-term performance and for *H6a*, *H7a*, and *H8a* on the effect of the EO dimensions (innovativeness, proactiveness, risk taking) on short-term performance. Model 2, which includes EO tested for hypothesis *H3a*. Model 3a, which includes innovativeness, tested for hypothesis *H6a*. Model 3b, which includes proactiveness, tested for hypothesis *H7a*. Model 3c, which includes risk taking, tested for hypothesis *H8a*.

In model 1, which includes the control variables, investment opportunity (t=3.89) and firm age (t=4.57) had a significant positive effect on ROA at the 1% level. Liquidity (t=2.43) had a significant positive effect at the 5% level. Leverage (t=-3.93) had a negative effect at the 1 % level. The regression explained 48 % of the changes in ROA.

Model 2, which includes EO, revealed that it had a significant negative effect on ROA at the 1% level (t=-5.58) confirming hypothesis *H3a*. Investment had a positive effect significant at the 1% level. Leverage had a significant negative effect at the 1 % level. The model explained 57 % of the changes in ROA.

Model 3a, which includes only innovativeness, revealed that innovativeness (t=-9.6) had a significant negative effect on ROA at the 1% level confirming hypothesis *H6a*. Systematic risk (t=-2.57) had a significant negative effect at the 5 % level. Investment opportunity and firm age had a significant positive effect at the 1 % level. Firm size and leverage had a significant negative effect on ROA at the 1 % level. The regression explained 58.3 % of the changes in ROA.

Model 3b, which includes proactiveness, showed that proactiveness (t=6.98) had a significant positive effect on ROA at the 1 % level confirming hypothesis *H7a*. Systematic risk had a significant negative effect on ROA at the 5 % level. Investment opportunity and firm age had a significant positive effect at the 1 % level. Firm size (t=-4.5) had a significant negative effect at the 1 % level. The regression explained 55 % of the changes in ROA.

Model 3c, which includes risk taking, revealed that risk taking (t=-5.05) had a decreasing concave relationship with ROA significant at the 1 % level confirming hypothesis *H8a*. Investment opportunity and firm age had a significant positive effect at the 1 % level. Liquidity (t=2.74) had a significant positive effect on ROA at the 1% level. Leverage had a significant negative effect at the 1 % level. The regression explained 50.8 % of the changes in ROA.

Table 8.26: Summary of Regression Results with Time Dummies among Failed Firms

Main Predictor Variables	**Dependent: Tobin's Q**	**Dependent: ROA**
EO	Negative significant effect at the 5% level (supporting hypothesis *H3b*)	Negative significant at 1% level (in support of hypothesis *H3a*)
Innovativeness	Positive significant at 5% level (supporting *H6b*)	Negative significant at 1% level (supporting *H6a*)
Proactiveness	Negative significant at 1 % level (supporting *H7b*)	Positive significant at 1% level (supporting *H7a*)
Risk taking	Insignificant (not supporting *H8b*)	Inverse U-shaped significant at 1% level (supporting *H8a*)

The following table 8.26 summarises and illustrates the results of the fixed effect regression models with each of Tobin's Q and ROA as the dependent variables. Similar to chapter 7, it was shown that each of the EO dimensions had differential effects on firm performance that were even distinctive when considering their effects on different measures of firm performance.

EO was shown to have a significant negative effect on firm performance measures (ROA and Tobin's Q) confirming hypothesis *H3a* and *H3b*.

Innovativeness was shown to have a negative effect on immediate returns (ROA) confirming hypothesis *H6a*, however a positive effect on long-term returns (Tobin's Q) confirming hypothesis *H6b*.

In contrast to innovativeness, proactiveness was shown to have a significant a positive effect on ROA in support of hypothesis *H7a,* yet negative effect on Tobin's Q supporting hypothesis *H7b*.

Risk taking was shown to have a significant negative quadratic effect on ROA confirming hypothesis *H8a.* It was also shown to have a significant negative effect on Tobin's Q without the time dummies at the 1% level, yet with the time dummies included it had an insignificant effect, not supporting hypothesis *H8b*.

The next sections will outline the robustness tests of the effects of the main predictor variables EO and its dimensions and the different forms of innovativeness that were utilised.

8.8 Robustness Check: Effect of EO and its Dimensions on Firm Performance among Failed Firms

This section tests the results of the fixed effect regression results by testing for endogeneity of the regressors as a robustness check by using the lagged values of the main predictor variables (by t-1, t-2, and t-3) as instruments on Tobin's Q and ROA. Thus, the instruments of the predictor variables are the predictor variables lagged backwards compared to the dependent variables by 1 year, two years, and three years. This section will first outline the results from the effect of EO on Tobin's Q and ROA regressions. Then subsequently, the section will outline the robustness results of innovativeness, proactiveness, and lastly risk taking. If the null hypothesis of lack of endogeneity is accepted, then this entails that the fixed effect regression results are valid. Otherwise, the effect of the lagged values of the predictor variables (EO and its dimensions) is tested on the dependent variables (firm performance measures).

8.8.1 Robustness of the Effect of EO on Firm Performance

The following section represents the endogeneity test of the effect of EO on firm performance.

Table 8.27: Robustness Check of Fixed Effect Regression Results of the Effect of EO on Tobin's Q and ROA including Time Dummies

EO	**Tobin's Q**	**ROA**
Endogeneity Test	2.379 (0.123)	3.003 (0.083)
Under-identification Test	8.847 (0.012)	8.946 (0.011)
Sargan-Hansen Statistics (Over-identification	0.387 (0.534)	0.559 (0.454)

p-value in parentheses

In the above table 8.27, the results of the endogeneity test of the regressor EO with both performance measures (Tobin's Q and ROA) accepted the null hypothesis of the exogeneity of the regressor EO. The under-identification test tests the null hypothesis that the instruments are uncorrelated with the regressor and are not relevant. The rejection of its null hypothesis at the 5% level indicates that the instruments used are relevant. Furthermore, the overidentification test tests the null hypothesis that the instruments are valid and uncorrelated with the error term. Thereby, the fixed effect regression results of the effect of EO on Tobin's Q and ROA were valid.

The above endogeneity test results revealed that hypothesis *H3a* and *H3b*, on the effect of EO on short-term and long-term firm performance in the sample of failed firms, were supported due to the lack of endogeneity.

The next section will outline the robustness check of the effect of the innovativeness dimension of EO on firm performance.

8.8.2 Robustness of the Effect of Innovativeness on Firm Performance

This section outlines the robustness results of the EO dimension innovativeness on firm performance.

Table 8.28: Robustness Check of Fixed Effect Regression Results of the Effect of Innovativeness on Tobin's Q and ROA including Time Dummies

Innovativeness	**Tobin's Q**	**ROA**
Endogeneity Test	0.885 (0.347)	6.47 (0.011)
Under-identification Test	20.889 (0)	9.734 (0.007)
Sargan-Hansen Statistics (Over-identification	0.005 (0.942)	0.149 (0.699)

p-value in parentheses

The above table 8.28 shows the results of the endogeneity test of the effect of innovativeness on firm performance (Tobin's Q and ROA). The endogeneity test of

Tobin's Q as the firm performance measure, innovativeness passed the exogeneity assumption. Thereby, the results of the fixed effect regression of innovativeness on Tobin's Q were valid as there was no endogeneity issue. However, with ROA as the dependent variable, the endogeneity test of innovativeness rejected the null hypothesis of exogeneity (p-value=0.011<0.05). Thereby, the results of the lagged values of innovativeness on ROA are presented below in table 8.29. By testing the lagged values of innovativeness on ROA, it would deal with the endogeneity issue.

Table 8.29: Robustness Check of Fixed Effect Regression Results of the Effect of Innovativeness on ROA including Time Dummies

ROA	**Lag 1**	**Lag 2**	**Lag 3**
Innovativeness	0.173* (1.84)	0.22** (2.19)	0.093 (1.19)
Systematic Risk	-0.103** (-2)	-0.058 (-0.98)	0.004 (0.09)
Investment opportunity	0.123**** (3.77)	0.134*** (3.36)	0.11** (2.61)
Firm size	-0.0438 (-0.31)	0.085 (0.56)	0.184 (1.15)
Firm age	0.556**** (4.21)	0.668**** (3.61)	0.478** (2.48)
Leverage	-0.194*** (-3.35)	-0.206*** (-3.45)	-0.223**** (-3.85)
Liquidity	0.145*** (2.71)	0.129** (2.37)	0.121* (1.91)
Constant	0.011 (0.15)	-0.013 (-0.18)	0.068 (1.09)
N	1391(298)	1097(244)	865(207)

Note: t-statistics in parentheses
*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

The lagged value of innovativeness by two years (at t-2) showed to have a significant effect on ROA (at t) (p<0.05). The lagged value at t-2 was thereby more significant than the lagged value at t-1. The results are similar to the results of chapter 7 of the lagged values of innovativeness.

The results indicated that a one standard deviation increase in innovativeness (at t-2) led to a 22 % increase in ROA (at t). This is quite different from the non-lagged value of innovativeness, which showed, in section 8.7, to have a significant negative effect on ROA.

The above results revealed that hypothesis *H6a*, on the effect of innovativeness on short-term performance, was not validated due to the presence of endogeneity. *H6b*, on the effect of innovativeness on long-term performance, was supported due to lack of endogeneity.

The next section will outline the robustness check of the effect of the proactiveness on firm performance.

8.8.3 Robustness of the Effect of Proactiveness on Firm Performance

This section outlines the robustness results of proactiveness on firm performance.

Table 8.30: Robustness Check of Fixed Effect Regression Results of the Effect of Proactiveness on Firm Performance including Time Dummies

Proactiveness	**Tobin's Q**	**ROA**
Endogeneity Test	1.950 (0.162)	35.867 (0.0)
Under-identification Test	12.823 (0.001)	24.133 (0.0)
Sargan-Hansen Statistics (Over-identification	0.085 (0.770)	2.808 (0.093)

Note: t-statistics in parentheses
*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

The above table 8.30 outlines the endogeneity test of the proactiveness dimension of EO and shows that the results of the fixed effect regression of proactiveness on Tobin's Q were valid as there were no issues of endogeneity. However, proactiveness was shown to be endogenous with ROA. Thereby, the lagged values of the proactiveness dimension is tested on ROA as will be shown in the table 8.31 below.

Table 8.31: Robustness Check of Fixed Effect Regression Results of the Effect of Proactiveness on ROA including Time Dummies

ROA	Lag 1	Lag 2	Lag 3
Proactiveness	-0.68**** (-5.66)	-0.482**** (-4.02)	-0.177** (-2.26)
Systematic Risk	-0.079 (-1.65)	-0.0304 (-0.55)	0.018 (0.34)
Investment opportunity	0.108*** (3)	0.095** (2.37)	0.096** (2.25)
Firm size	0.351** (2.36)	0.303** (2)	0.254 (1.48)
Firm age	0.345*** (2.8)	0.479*** (2.64)	0.396* (1.95)
Leverage	-0.267**** (-3.98)	-0.227**** (-3.73)	-0.226**** (-3.93)
Liquidity	0.14*** (2.83)	0.122** (2.33)	0.125* (1.96)
Constant	0.134 (1.46)	0.1009 (1.49)	0.127** (2)
N	1384(298)	1091(244)	860(207)

Note: t-statistics in parentheses
*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

The lagged value of proactiveness by 1 year (at t-1), in the above table 8.31, had a significant negative effect on ROA (p<0.001). This is also quite contrasting from the non-lagged value of proactiveness, in section 8.7, that had a significant positive effect on ROA.

The lagged value by two years (p<0.001) and lagged value by three years of proactiveness (p<0.05) also had a significant negative effect on ROA.
The lagged value of proactiveness at t-1 led to a 68 % decrease in ROA, the lagged value at t-2 leads to a 48 % decrease, and the lagged value at t-3 led to a 17.7 % decrease in ROA.

The above results revealed that hypothesis *H7a*, on the effect of proactiveness on short-term performance, was not supported due to endogeneity. *H7b*, on the effect of proactiveness on long-term performance, was validated due to lack of endogeneity.

The next section will present the robustness results of the effect of the risk taking dimension of EO on firm performance.

8.8.4 Robustness of the Effect of Risk taking on Firm Performance

This section presents the endogeneity test results of risk taking on firm performance (Tobin's Q and ROA).

Table 8.32: Robustness Check of Fixed Effect Regression Results of the Effect of Risk taking on Firm Performance including Time Dummies

Risk taking	**Tobin's Q**	**ROA**
Endogeneity Test	0.209 (0.64)	0.085 (0.77)
Under-identification Test	13.096 (0.001)	13.274 (0.001)
Sargan-Hansen Statistics (Over-identification	0.227 (0.633)	0.559 (0.454)

p-value in parentheses

The above table 8.32 shows the results of the endogeneity test of the effect of risk taking on the firm performance (Tobin's Q and ROA). The endogeneity test results of risk taking on firm performance indicated that there was no endogeneity issue. Thereby, the fixed effect results of risk taking on firm performance measures were valid.

The above results revealed that hypothesis *H8(a* and *b),* on the effect of risk taking on the short-term and long-term performance, was supported due to the lack of endogeneity.

The next section will outline the robustness check from the different measures of the innovativeness dimension of EO that were used instead of the main innovativeness measure as R&D intensity.

8.9 Robustness Check: Alternative Forms of Innovativeness among Failed Firms

The following brief section shows the robustness check of the results from the alternative measures of innovativeness that were used. The first measure termed intangible innovation was used measured as R&D/number of employees. The second measure is termed patent yield and measures the ratio of the number of patents at application date divided by R&D expenditure. This section shows the different results using the alternative measures of innovativeness.

Table 8.33: Effect of Alternative Forms of innovativeness on Tobin's Q/ROA

	Tobin's Q	**ROA**
Innovativeness (R&D/employees)	-0.1205** (-2.04)	-0.616**** (-4.74)
Innovativeness (Number of Patents/R&D)	-0.088 (-1.19)	0.15** (1.98)

Note: t-statistics in parentheses
*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

Similar to chapter 7, the alternative form of innovativeness in the form of the ratio of R&D expenditures to number of employees had a negative effect on Tobin's Q at the 5 % level (t=-2.04) and ROA at the 1 % level (t=-4.74). The second form of innovativeness, which was represented by the ratio of the number of patents to R&D expenditure had an insignificant effect on Tobin's Q, yet a significant positive effect on ROA at the 5% level (t=1.98).

8.10 Chapter Conclusion

The chapter's fixed effect regression results revealed that EO had a significant negative effect on short-term and long-term performance among the sample of failed firms, supporting *H3a* and *H3b*.

With regards to the EO dimensions, innovativeness had a positive effect on long-term performance in support of *H6b*. Proactiveness had a significant negative effect on long-term performance supporting *H7b*. Lastly, risk taking was shown to have a significant negative concave effect on short-term performance supporting *H8a* and an insignificant effect on long-term performance, not supporting *H8b*.

It is important to note that in both chapters 7 and 8, endogeneity was present when testing the effect of the EO dimensions, innovativeness and proactiveness, on ROA. Thereby, when testing for their effects on recent performance, their lagged values were used instead to address the endogeneity problem. After adjusting for endogeneity, their lagged values on ROA were similar to the results of their effects on Tobin's Q.

The next chapter is the survival analysis chapter. Survival analysis will be used to examine the effect of EO and its dimensions on the failure rate of firms.

Chapter 9

Survival Analysis of EO and its Dimensions and Firm Performance

9.1 Introduction to the Chapter

This chapter examines the effect of EO on the failure rate of firms. The Cox proportional hazard model was used to empirically assess the effect of the main variables (EO and its separate dimensions) on the probability or risk of failure of the sample of firms. The survival analysis was conducted in SAS since SAS has comprehensive features for conducting survival analysis (Allison, 2010). Hazard models have long been used in the literature to analyse firms' failure (Cefis & Marsili, 2005).

EO has been ubiquitously viewed in the literature as advantageous on firm performance (Rauch et al., 2009). In chapter 7, it was shown that among the sample of surviving firms, EO has an inverse U-shaped relationship with short-term and long-term measures of firm performance (ROA and Tobin's Q). In chapter 8, among the sample of failed firms, it was shown that EO had a significant negative relationship on both measures of firm performance. The results of the fixed effect panel regressions aligned with the EO-as-Experimentation perspective.

In this chapter, it is important to advance the results from the previous chapters 7 and 8, which focus on the effect of EO on firm performance, by also considering the effect of EO on the risk of firm failure. According to Wiklund and Shepherd (2011), most of the literature has studied the effect of EO on firm performance only amongst surviving firms (e.g. Rauch et al. 2009). The significance of this thesis is that not only it considers the EO-firm performance relationship in the sample of surviving firms and failed firms separately, but also considers the effect of EO on the risk of firm failure in the overall sample of firms. This is of relevance since according to the EO-as-Experimentation perspective, EO results in higher performance variance and might lead to higher risk of business failure (Wiklund & Shepherd, 2011).

The first section of this chapter will outline the survival figures of the sample of high-technology firms to test hypothesis *H5*, followed by the pre-analysis procedure of testing the assumptions of the Cox regression (linearity and the proportionality assumption testing followed by multicollinearity testing). The chapter will finally outline the survival analysis regression results and the survival graphs of firms high in EO and its dimensions.

The following chapter aims to answer the below hypotheses. The hypotheses were outlined in the theoretical chapter 3. Thus, the hypotheses that were tested in this chapter are:

9.1.1 Hypotheses: EO and Firm Failure

H4: The relationship between EO and the risk of firm failure is positive over time.
H5: High-technology industry is more entrepreneurially oriented and has a lower survival probability in comparison to other industries.

9.1.2 Hypotheses: EO Dimensions and Firm Failure

H6c: Innovativeness has a negative effect on firm failure.
H7c: Proactiveness has a positive effect on firm failure.
H8c: Risk taking has a positive effect on firm failure.

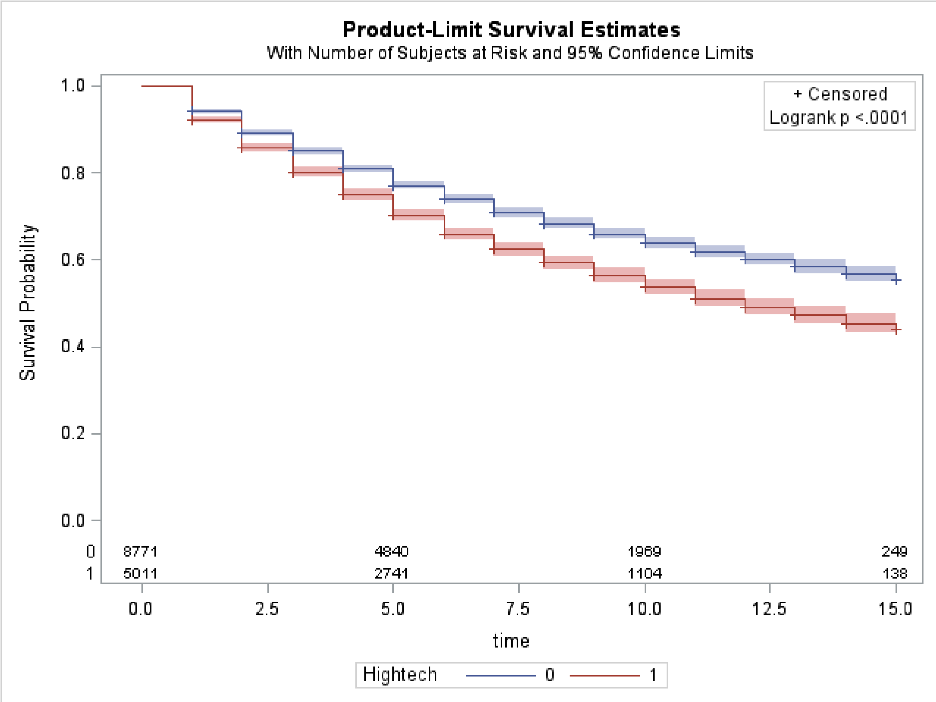
9.2 The Survival Figures of the Sample of High-technology Firms

Before outlining the pre-analysis procedure of checking the assumptions of the Cox regression, this section will outline the survival figures of the sample of the high-technology firms included in the Study.

The following section outlines the survival figures of the sample of high-technology firms (the sample of the thesis). The first figure 9.1 will outline the survival probability of the sample of high-technology firms versus the excluded sample. The latter sample of firms was not included in the classification of high-technology firms (by the industrial classification (four-digit SIC codes) of Loughran and Ritter (2004)). The second figure will outline the survival trend of the high-technology firms.

This section aims to test the hypothesis that the high-technology industry has a lower survival probability in comparison to other industries.

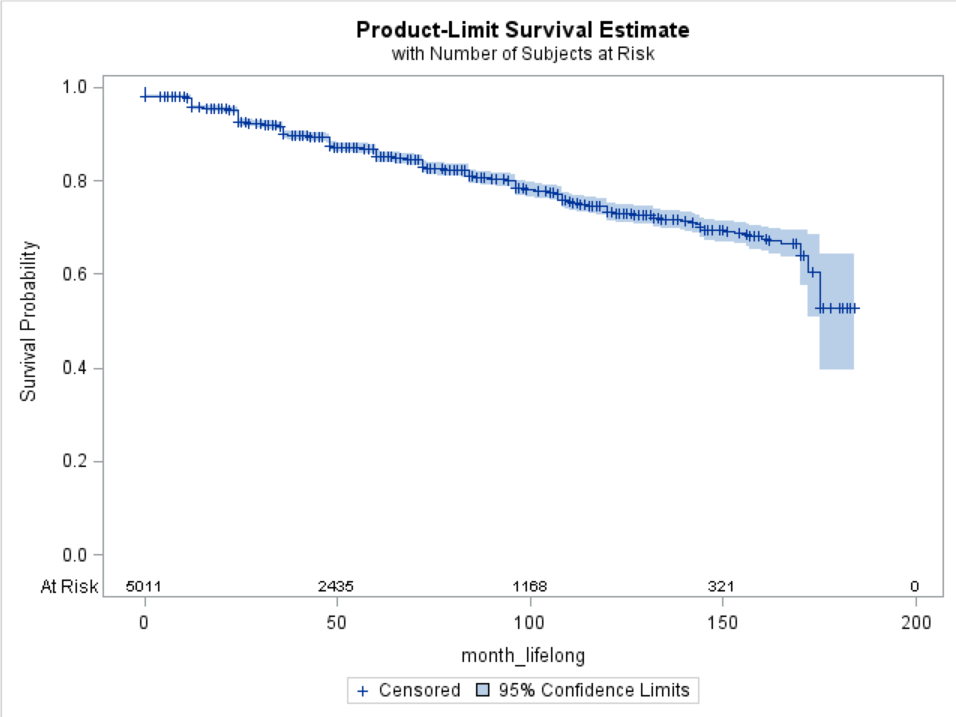
Figure 9.1: Survival Figure of High-technology versus Excluded Firms



The above figure 9.1 shows the survival probability of high-technology firms versus the excluded sample of the firms across the period of the 15 years (from fiscal year 2000 until fiscal year 2014). The high-technology firms were coded as 1 and coloured red whereas the rest of the firms were coloured blue. The figure indicates that the high-technology firms had a lower survival probability in comparison to firms from other industries and this was significant, by utilising the log-rank test, at the 1% level (p-value<0.0001). Thereby, hypothesis *H5*, on the effect of the high-technology industry on the survival probability of firms, was confirmed.

The survival of the high-technology firms was significantly lower in comparison to firms that do not belong in the high-technology industrial classification. This clearly shows that the high-technology firms, which are faced by the competitive intensity of the high-technology industry, are at the risk of a lower probability of survival. This indicates that the high-technology dummy variables must be included in the Cox regression. The high-technology dummies were included in the regressions as was shown in the methodology chapter 6 (equations 4.1 and 4.2).

Figure 9.2: Survival Figure of High-technology Firms



Summary of Number of Censored and Uncensored Values			
Total Observations	**Failed**	**Censored**	**Percent Censored**
5,011	810	4201	83.84

The above figure 9.2 shows the overall survival of the sample of firms in the high-technology industry. As shown in the table of the figure, there was a total of 5,011 observations of which 810 were observations of failed firms. The figure shows the number of firms that were at risk of failure at each period. At time zero there were 5,011 observations in total. At time month 50, there were 2,435 observations of surviving firms. Thereby, by time 50 months or 4 years and two months, more than half of the firms had failed. By time 150 months, 321 observations of firms were found. By 200 months, the above figure indicated zero observations since by the end of this Study's timeframe, the observations for the firms ended.

The next section will outline the pre-analysis procedure of testing the proportional hazard regression assumptions before presenting the regression results.

9.3 Pre-analysis Procedure: Testing Assumptions of the Cox Regression

The assessment of the two Cox regression equations in Chapter 6, in the case of the regression of EO as the predictor variable and the EO dimensions as the main predictor variables, was done through the functional form or linearity test followed by the proportionality assumption test of the Cox regression. Furthermore, multicollinearity was tested through the VIF and the correlation matrix of the regressors.

The first of this section will outline the functional form test of the regressors (control variables followed by EO and its dimensions). Subsequently, it will outline the proportionality test results of the time-varying regressors (the control variables followed by the main predictor variables EO and its dimensions). Lastly, this section will test for multicollinearity, similar to chapter 7 and 8, through the VIF and the correlation coefficients.

9.3.1 Functional Form Test of Regressors

The following section outlines the figures that were used to assess the linearity of the variables. The martingale residuals were generated to test the functional forms of the variables of the Cox regression (Therneau et al. 1990). In the below figures, the loess fit plot with scatterplot smoother was applied to show whether the relationships were linear or quadratic. If the smoother plot was non-linear this was an indication of a non-linear covariate. The martingale residuals were defined as observed values minus the expected values (Therneau et al. 1990). Values above the loess line indicate that the observed events were greater than those expected by the model. Hence, this either indicates that the observed events (i.e. in this case the event is failure) are in excess to the predicted model or that the observed failure occurred before the model prediction. Conversely, large negative values either indicated that the failure events were deficient to the predicted events or that the observed failure occurred after the model prediction (Wilson, 2013). Thus, this shows that firms with large positive values of the residuals means experienced the event of failure soon and in contrast those with large negative values means survived too long. Some researchers do not check the functional form of the covariates before testing the proportional hazard assumption (e.g. Revilla et al., 2016). This would mistakenly result in a false negative impact on the proportional hazard assumption, when in fact it is a functional form misspecification (Wilson, 2013). The below presents the figures of each of the variables against the martingale residuals to test the linearity assumption of the covariates.

The functional form test will first outline the figures of the control variables followed by the figures of EO and its dimensions.

9.3.1.1 Functional Form Test of the Control Variables

The following section represents the functional form test of the control variables of the Cox regression by presenting the martingale residual scatterplots to assess the linearity assumption of the covariates.

Figures 9.3: The Residual Scatterplots of Systematic Risk

The following represents the linearity testing of the control variable systematic risk through the martingale residual scatterplots.

Figure 9.3.1: The Martingale Residual Scatterplot of Systematic Risk

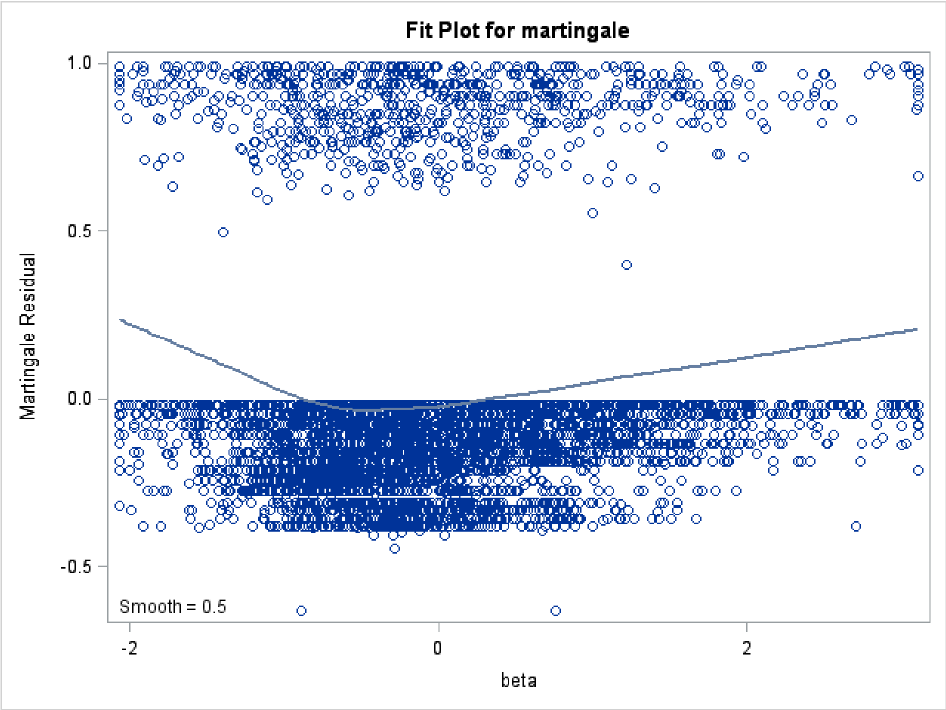
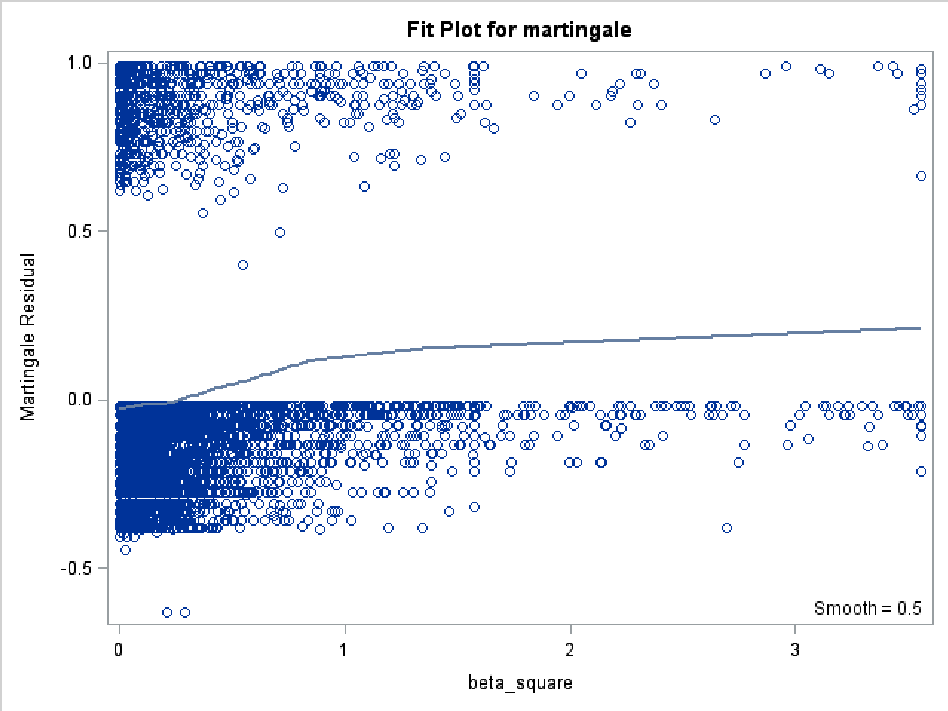
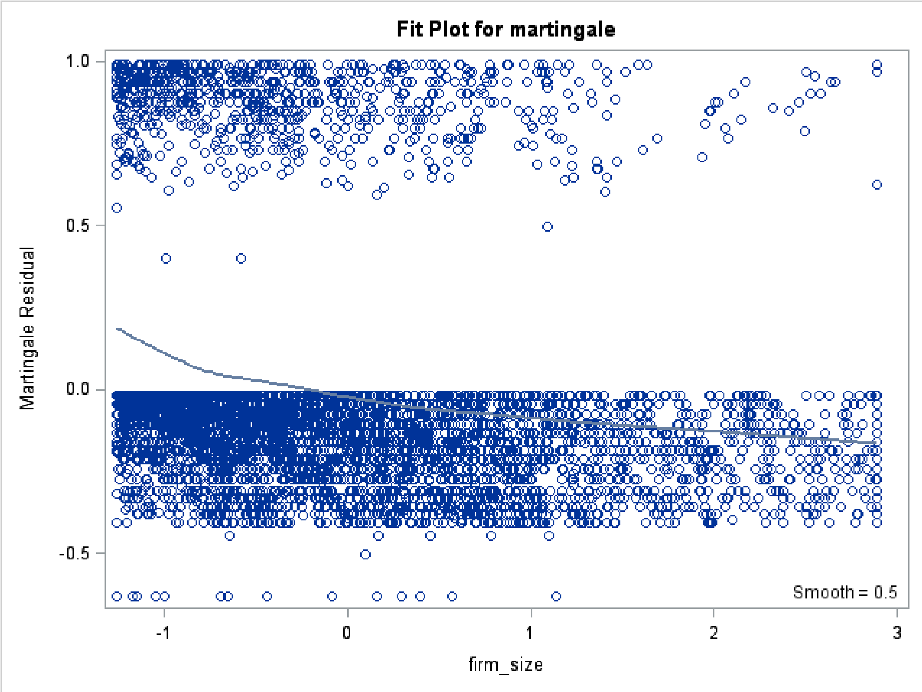


Figure 9.3.2: The Martingale Residual Scatterplot of Systematic Risk Squared



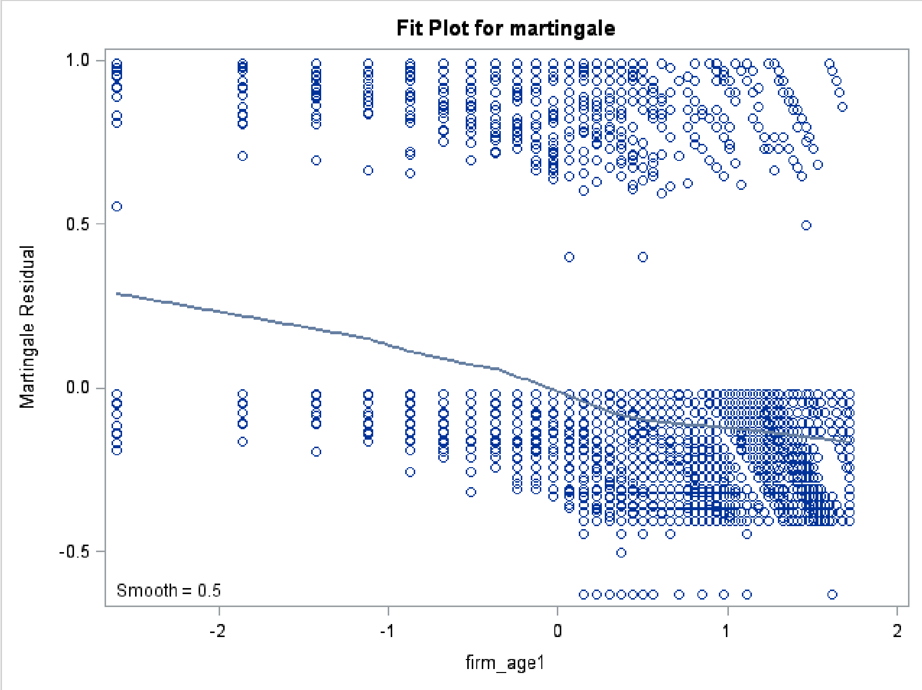
The above figures of systematic risk against the martingale residuals indicates that the relationship is not linear (in the form of a quadratic relationship) between systematic risk and the martingale residuals. Thereby, the systematic risk variable was squared, and the squared version of the variable was plotted against the martingale residuals. The second figure 9.3.2 indicates that the squared version of the variable was the true functional form.

Figure 9.4: The Martingale Residual Scatterplot of Firm Size



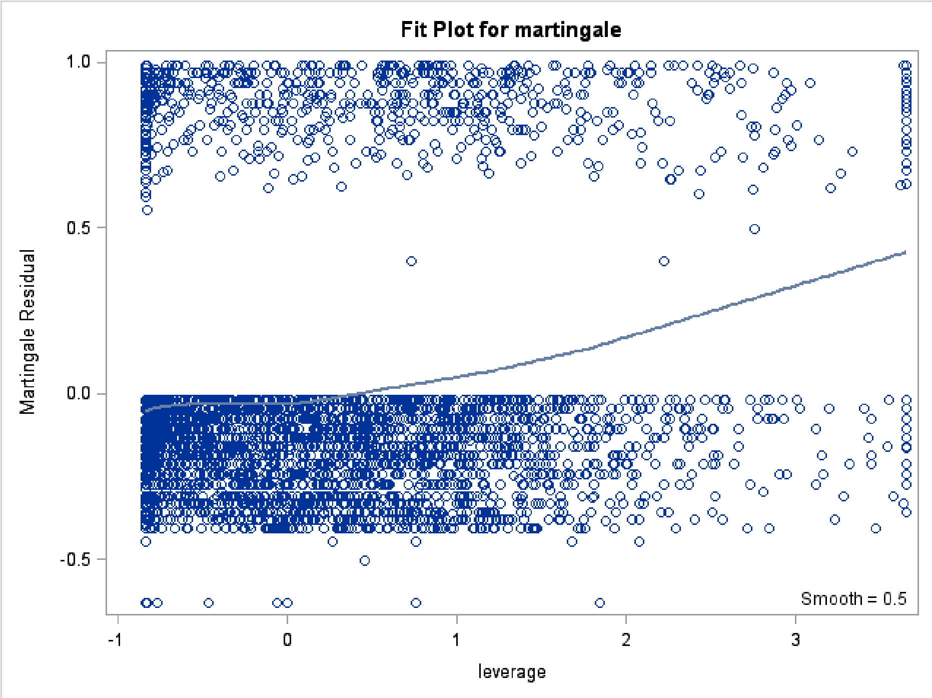
The following represents the functional form test of the control variable firm size using the martingale residual scatterplot. The above figure 9.4 of firm size against the martingale residuals indicates that the relationship was linear between firm size and the martingale residuals. The large negative values in residual plot 9.4 indicate that the observed values of firm size occurred after the predicted model. Thus, as predicted from the theoretical explanation, firm size affected firm failure by prolonging firm failure.

Figure 9.5: The Martingale Residual Scatterplot of Firm Age



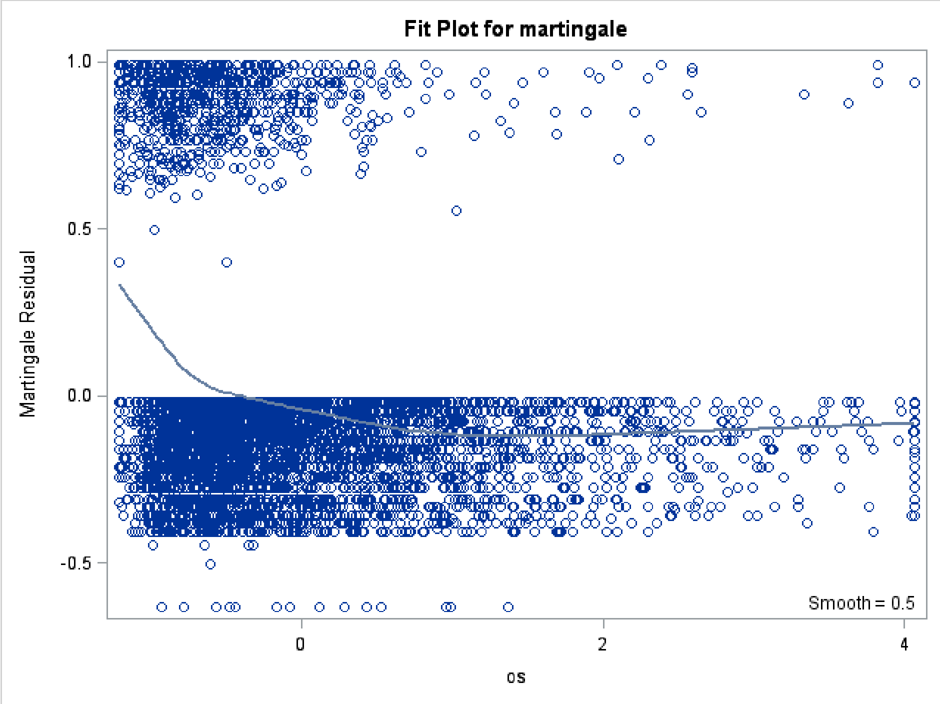
The above figure 9.5 of firm age against the martingale residuals indicates that the relationship appeared to be mostly linear between firm age and the martingale residuals. However, as hypothesised a squared term of firm age should be added onto the regression to account for the quadratic relationship of firm age with firm failure.

Figure 9.6: The Martingale Residual Scatterplot of Leverage



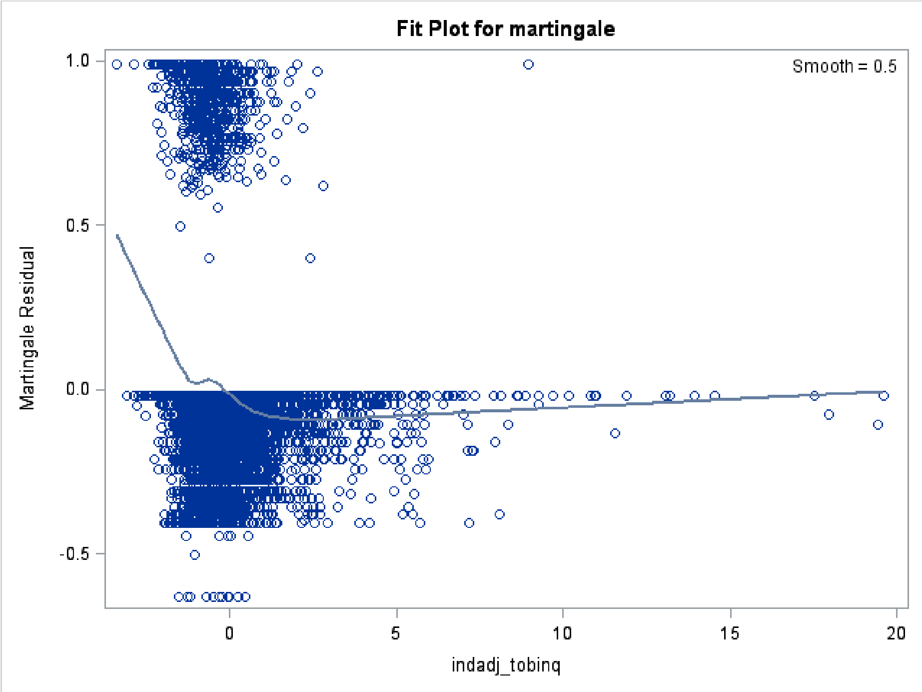
The following represents the functional form test of the control variable leverage by using the martingale residual scatterplot. The above figure 9.6 of leverage against the martingale residuals indicates that the relationship was linear between leverage and the martingale residuals. Thereby, leverage satisfied the assumption of linearity of the Cox regression.

Figure 9.7: The Martingale Residual Scatterplot of Organisational Slack



The above figure 9.7 of organisational slack against the martingale residuals indicates that the relationship was linear between organisational slack and the martingale residuals. The large negative values showed that the observed values of organisational occurred after the predicted model. Thus, organisational slack affected firm failure by prolonging firm failure and this was expected based on its theoretical explanation in chapter 6.

Figure 9.8: The Martingale Residual Scatterplot of Tobin's Q

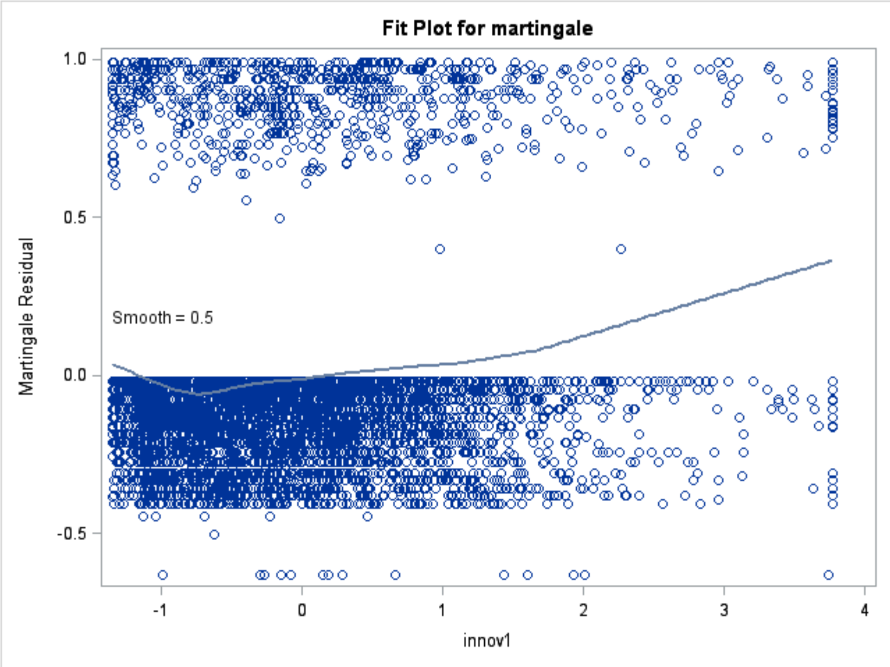


The above figure 9.8 of Tobin's Q against the martingale residuals indicates that the relationship was linear between Tobin's Q and the martingale residuals. Thus, the linearity assumption holds.

9.3.1.2 Functional Form Test of the Main Predictor Variables EO and its Dimensions

The following section represents the functional form test of the main predictor variables. The section will first outline the martingale residual scatterplot of innovativeness dimension, followed by the proactiveness, risk taking dimensions and finally the EO construct.

Figure 9.9: The Martingale Residual Scatterplot of Innovativeness

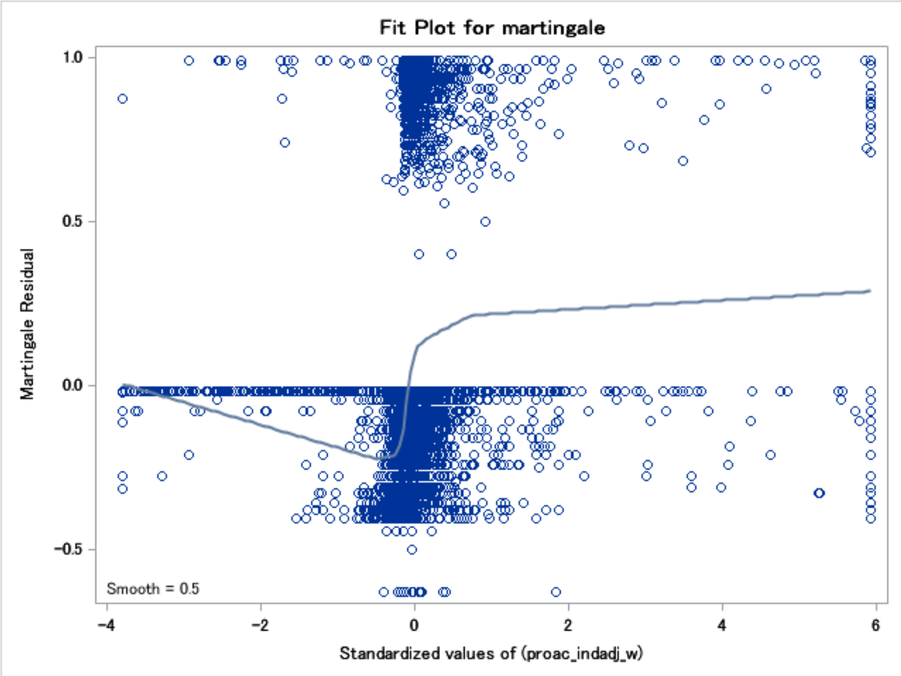


The above figure 9.9 loess fit plot of the variable innovativeness against the martingale residuals indicates that the relationship was linear between the variable innovativeness and the martingale residuals. Thereby, the variable innovativeness had the correct functional form.

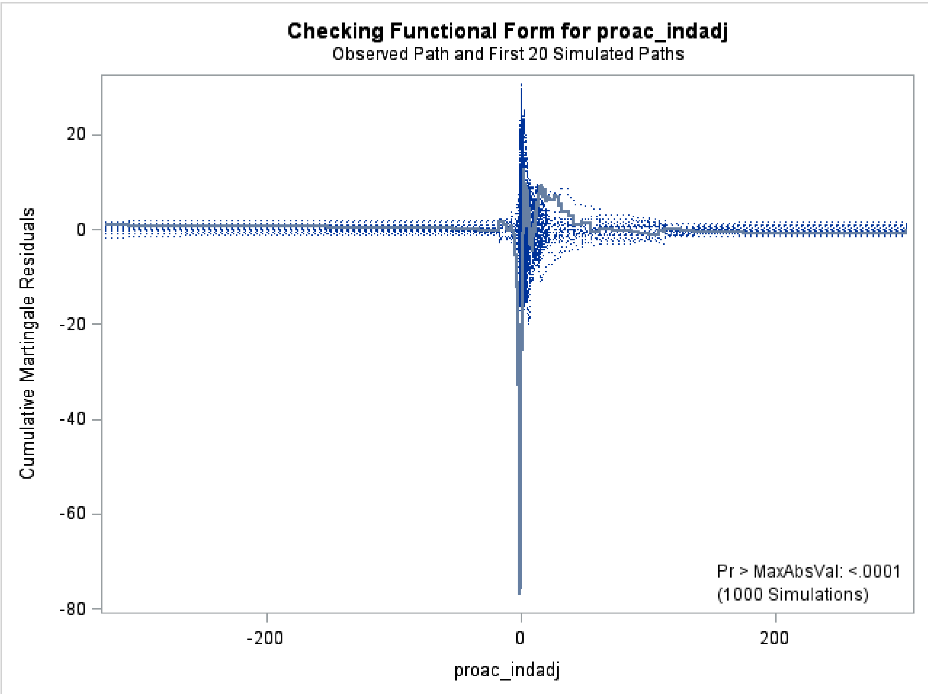
Figures 9.10: The Residual Scatterplots of Proactiveness

The following represents the functional form test of the proactiveness dimension of EO.

Figures 9.10.1: The Martingale Residual Scatterplots of Proactiveness

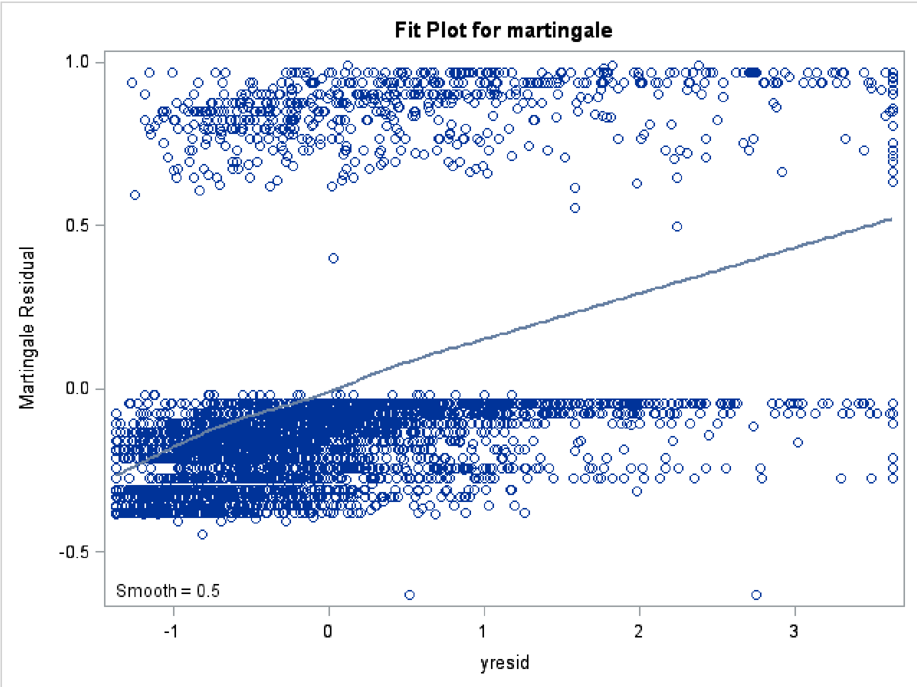


Figures 9.10.2: The Cumulative Residual Scatterplots of Proactiveness



The above figures of proactiveness against the martingale residuals indicate that the relationship was not linear between proactiveness and the martingale residuals (the null hypothesis of linearity was rejected as shown in the second graph of the cumulative martingale residual scatterplot). Thereby, the variable proactiveness was transformed into a categorical variable, which equals to 1 if values of proactiveness were higher than zero and a value of zero for values that were lower than zero.

Figure 9.11: The Martingale Residual Scatterplot of Risk taking



The above figure 9.11 of risk taking against the martingale residuals indicates that the relationship was linear between risk taking and the martingale residuals. Thereby, the variable risk taking had the correct functional form.

Figures 9.12: The Residual Scatterplots of EO

The following section represents the linearity testing of the EO construct.

Figure 9.12.1: The Martingale Residual Scatterplot of EO

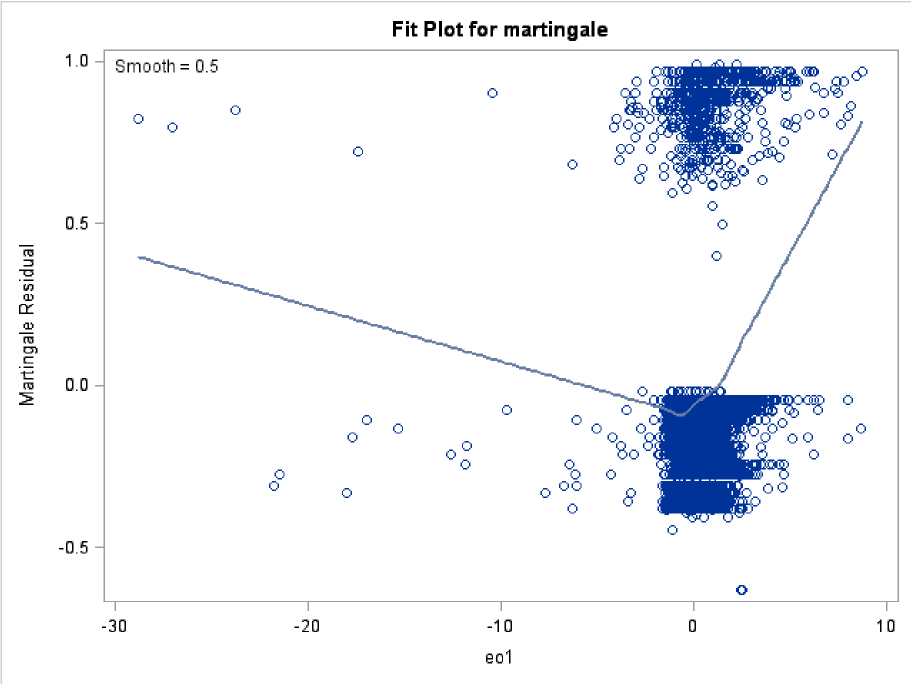
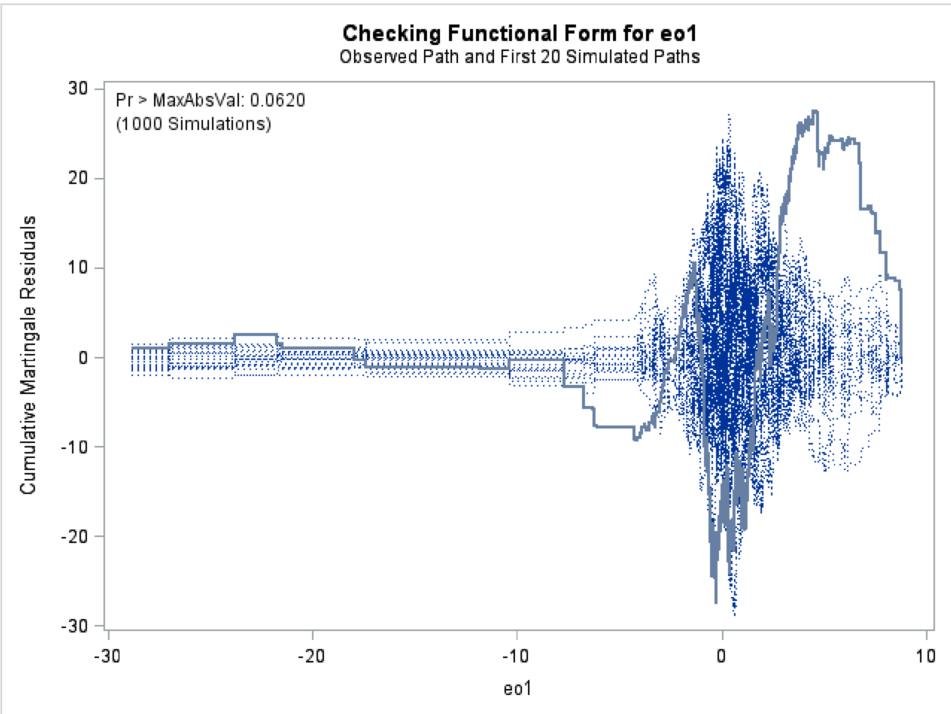


Figure 9.12.2: The Cumulative Martingale Residual Scatterplot of EO



To validate the linearity testing, the second figure 9.12.2 showed that EO had the correct functional form, which uses the cumulative sum of martingale residuals against the values of the variable EO (Lin et al., 1993). Based on 1,000 random simulations of the residual pattern, it indicates the observed martingale residuals did not deviate from the simulated residual patterns and the null hypothesis of linearity was accepted.

The next section will outline the proportionality testing of the regressors, starting with the control variables followed by the EO dimensions and lastly the EO construct.

9.3.2 Proportional Hazard Assumption Test of Regressors

The figures based on the Schoenfeld residuals as a function of time were utilised to assess the proportionality hazard assumption of the predictor variables. The Schoenfeld residuals are considered to have a different characteristic to other residuals by having a separate value for each covariate for each firm or observation included (Allison, 2010). The Schoenfeld residuals are the difference between the covariate value of a specific observation or firm and the average value of the observations at risk (i.e. failed firms). Thus, the average value of the Schoenfeld residuals would indicate the change of a specific covariate with time (Grambsch & Therneau, 1994). If the average change of the covariate with time is zero, then this indicates that the proportionality assumption holds. Conversely, if the slopes of the figures were shown to be significantly fluctuating from zero, then this indicates that the proportionality assumption does not hold since they depend on time (Allison, 2010). The loess smoother was used as well to smooth the plot.

The below section first outlines the hazard proportionality test, which shows the significance of the variables. The null hypothesis is that the variables are proportional with time. If the null hypothesis is rejected, this indicates that the variables violate the proportionality assumption. Subsequently, the section will present the figures of each of the variables against the Schoenfeld residuals.

Table 9.1: Proportionality Assumption Testing of Time-varying Variables

Predictor Variables	P	Chi2	Df	Prob>chi2
Innovativeness	-0.026	0.47	1	0.493
Proactiveness	0.036	1.07	1	0.299
Risk Taking	-0.115	9.00	1	0.002
EO	-0.124	21.23	1	0.0
Systematic Risk	-0.026	0.54	1	0.463
Leverage	0.016	0.20	1	0.653
Organisational Slack	-0.06	3.54	1	0.06
Firm Age	-0.029	0.56	1	0.456
Firm size	-0.015	0.20	1	0.654
Tobin's Q	0.068	2.88	1	0.089

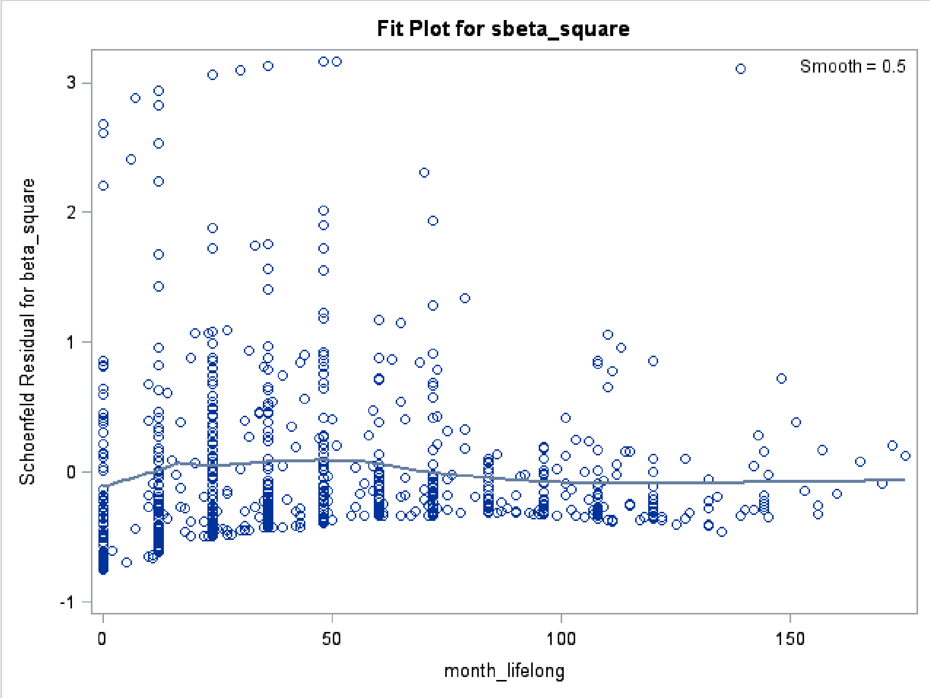
The above table 9.1 presents the proportionality test results of each of the time-varying predictor variables after running separate cox regression equations of the control variables, EO, and lastly of the separate EO dimensions. The results of the proportionality test from STATA validated the results of the Schoenfeld residual graphs from SAS. It was found that EO and its dimension risk taking violated the proportional hazard assumption ($p<0.01$). Thus, to remedy this, their interaction with time was included in the regression.

The next section will outline the residual scatterplots of the Schoenfeld residuals.

9.3.2.1 Proportional Hazard Assumption Test of Control Variables

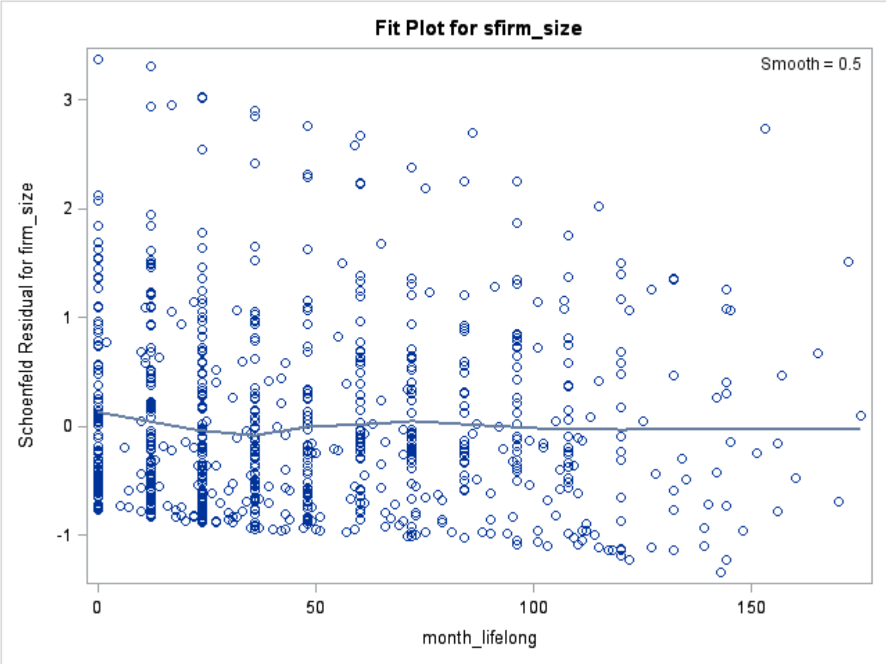
The following represents the proportionality hazard test of the control variables by using the Schoenfeld residual scatterplots.

Figure 9.13: The Schoenfeld Residual Scatterplot of Systematic Risk Squared



The above figure 9.13 of the fit plot of systematic risk Schoenfeld residual with time indicates that the variable was proportional with time since the smooth plot did not vary from zero. Furthermore, its interaction with time was added onto the cox regression, which showed that it was not significant with time. Thus, this indicates that the hazard proportionality assumption holds for systematic risk.

Figure 9.14: The Schoenfeld Residual Scatterplot of Firm Size

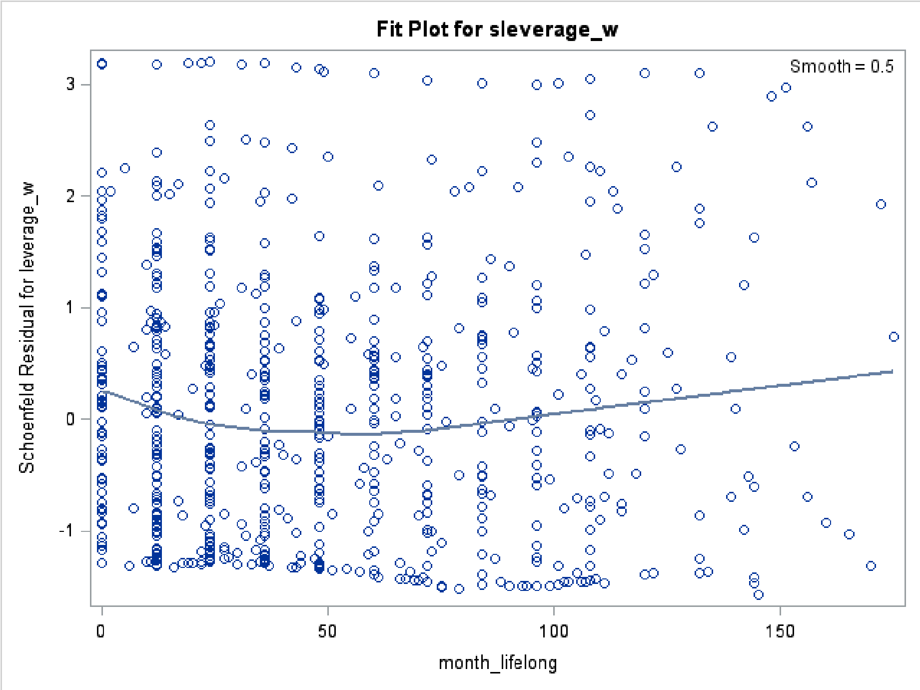


The above figure 9.14 of the fit plot of the Schoenfeld residuals of firm size with time shows that it was proportional with time since the smooth plot did not vary much from zero. Furthermore, its interaction with time was added onto the cox regression, which showed that it was not significant with time. Thus, this indicates that the hazard proportionality assumption holds.

Figure 9.15: The Schoenfeld Residual Scatterplot of Firm Age

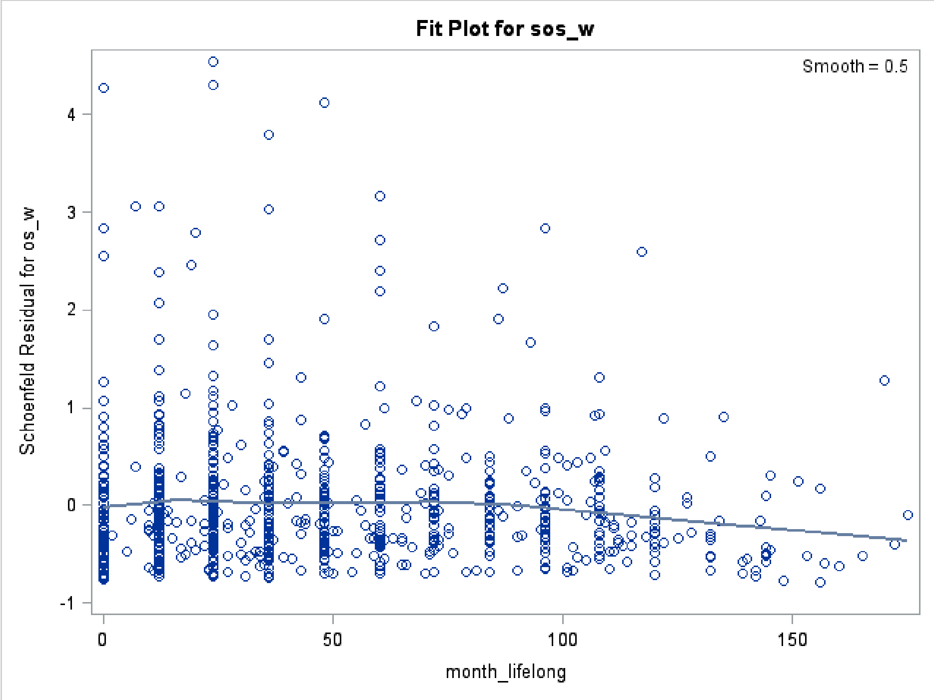
The above figure 9.15 of the fit plot of the Schoenfeld residuals of the control variable firm age with time shows that the variable was proportional with time since the smooth plot did not vary significantly from zero. Furthermore, its interaction with time was included in the cox regression, which showed that it was not significant with time. Thus, this indicates that firm age is independent of time or proportional with time.

Figure 9.16: The Schoenfeld Residual Scatterplot of Leverage



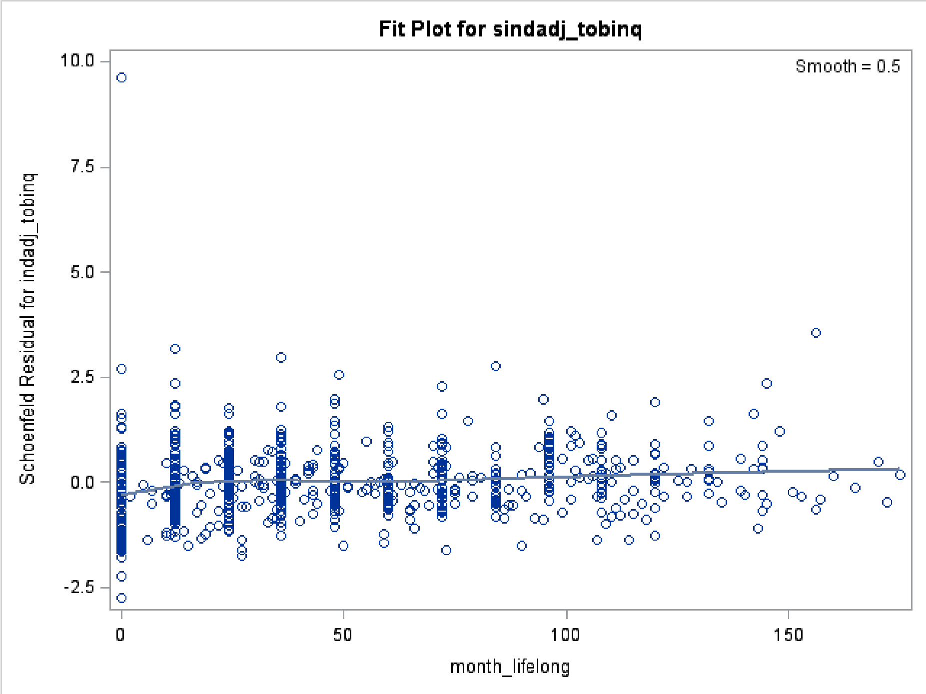
The above figure 9.16 of the fit plot of the Schoenfeld residuals of the variable leverage with time shows that it was proportional with time since the smooth plot did not vary much from zero. Furthermore, the variable's interaction with time was added onto the cox regression, which showed that it was not significant with time.

Figure 9.17: The Schoenfeld Residual Scatterplot of Organisational Slack



The above figure 9.17 of the fit plot of the Schoenfeld residuals of organisational slack with time shows that it was proportional with time since the smooth plot did not vary much from zero. Furthermore, the variable's interaction with time was added onto the cox regression, which showed that it was not significant with time. Thus, this indicates that organisational slack did not depend on time and was proportional with time.

Figure 9.18: The Schoenfeld Residual Scatterplot of Tobin's Q



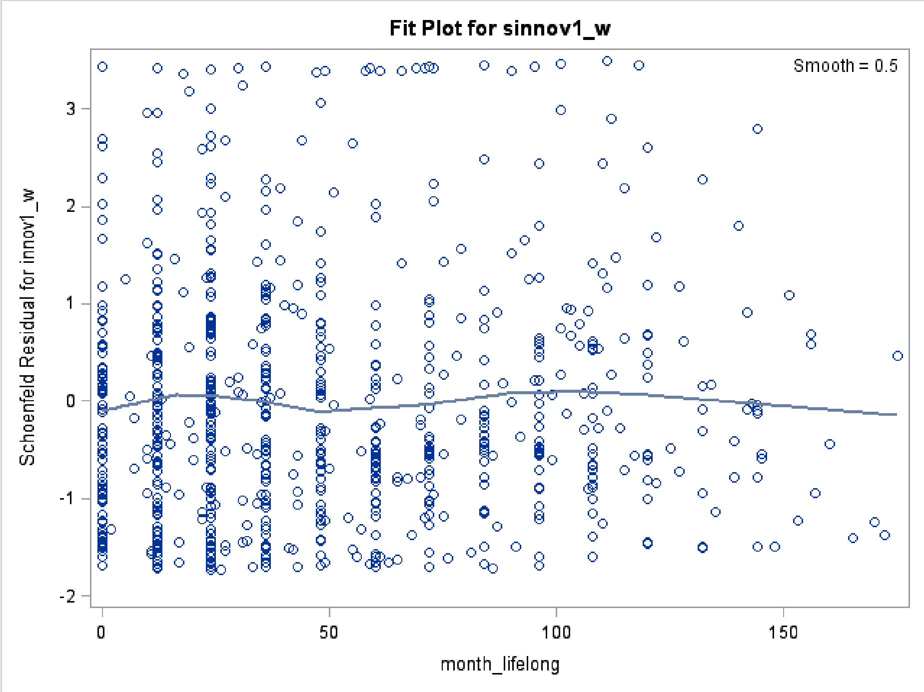
The above figure 9.18 of the fit plot of the Schoenfeld residuals of Tobin's Q with time shows that it was proportional with time since the smooth plot did not vary with time. Furthermore, the variable's interaction with time was added onto the cox regression, which showed that it was not significant with time.

The next section will outline the Schoenfeld residual scatterplots of the main predictor variables.

9.3.2.2 Proportional Hazard Assumption Test of Predictors

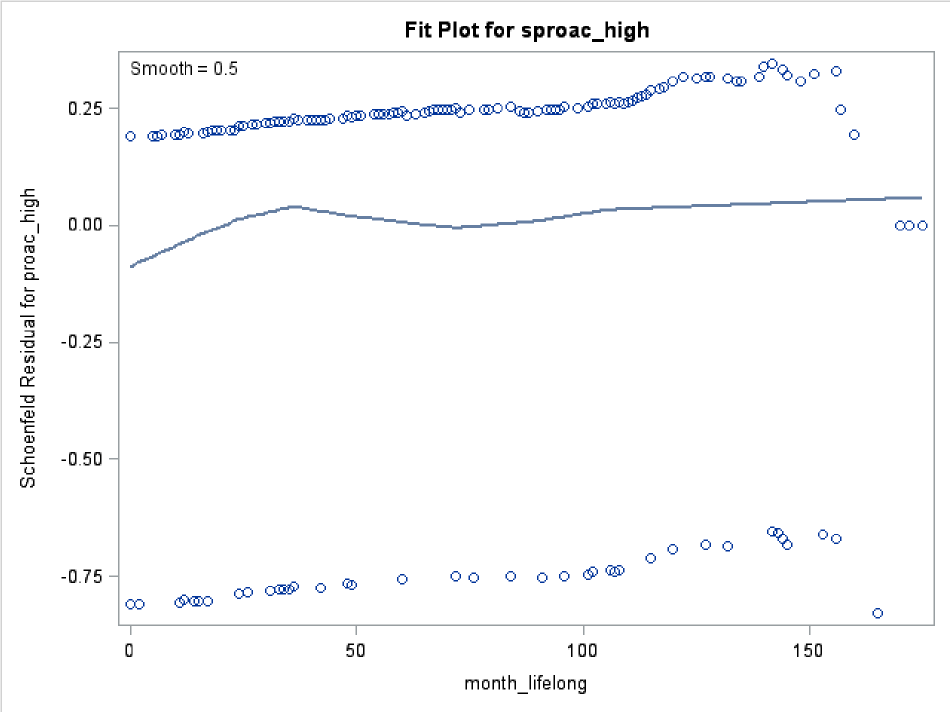
The following section outlines the hazard proportionality assumption tests of the main predictor variables EO and its dimensions. The section will first outline the test of the innovativeness dimension, followed by proactiveness, and risk taking. Lastly, the Schoenfeld residual scatterplot of EO will be outlined.

Figure 9.19: The Schoenfeld Residual Scatterplot of Innovativeness



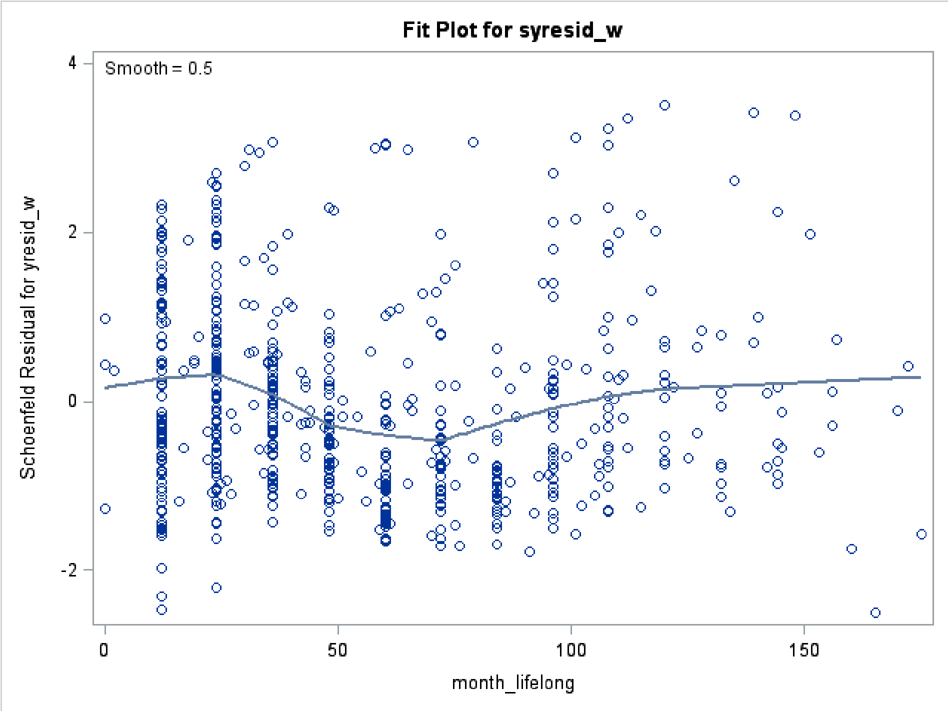
The above figure 9.19 of the Schoenfeld residuals of innovativeness with time indicates that innovativeness was proportional with time since the smooth plot was flat at zero. Thus, this indicates that innovativeness variable was independent of time. The hazard proportionality assumption holds for the variable innovativeness. Furthermore, the interaction with time was added onto the cox regression, which showed that the coefficient was insignificant. This further validated the results of the figure.

Figure 9.20: The Schoenfeld Residual Scatterplot of Proactiveness



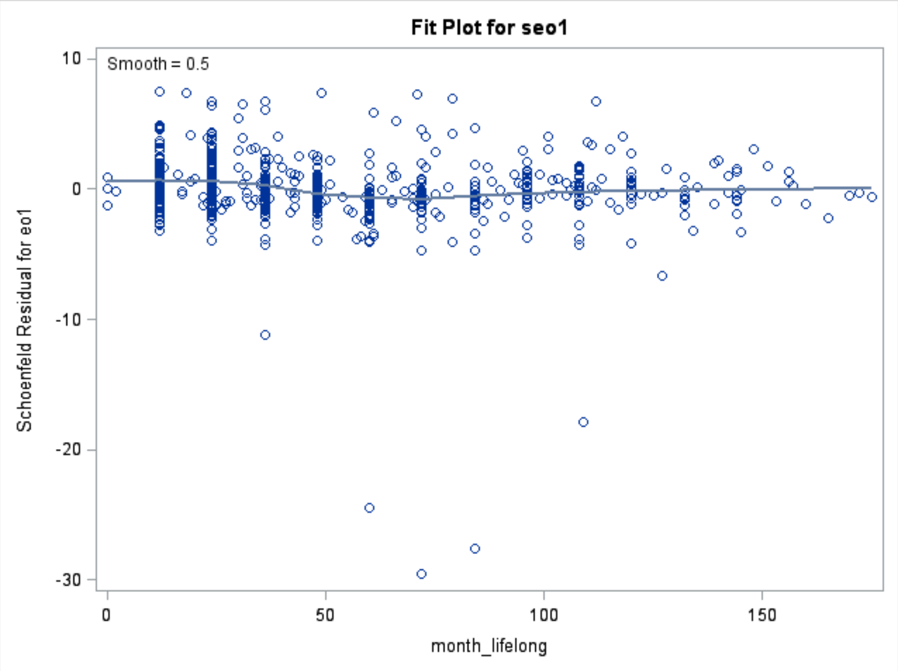
The above figure 9.20 of the residuals of the categorial variable proactiveness with time indicates that proactiveness seemed to be proportional with time since the smooth plot did not vary much from zero. The interaction with time was added onto the cox regression, which showed that it was not significant with time. Thus, this indicates that the hazard proportionality assumption holds for the variable proactiveness.

Figure 9.21: The Schoenfeld Residual Scatterplot of Risk taking



The above figure 9.21 of the fit plot of the risk taking residual with time indicates that the variable risk taking was not proportional with time since the smooth plot varied significantly from zero. Furthermore, the interaction of the variable with time was added onto the cox regression, which showed that it was significant with time. Thus, this indicates that the hazard proportionality assumption did not hold for risk taking. This means that risk taking depends on time.

Figure 9.22: The Schoenfeld Residual Scatterplot of EO



The above figure 9.22 of the fit plot of the residuals of EO with time indicates that it seemed to be proportional with time since the smooth plot did not vary significantly from zero. However, the interaction of EO with time was added onto the cox regression, which showed that it was significant with time. Thus, this indicates that the hazard proportionality assumption did not hold for EO.

The next section will outline multicollinearity testing of the regressors of the Cox regression before outlining the results of the Cox regression.

9.3.3 Multicollinearity Test of Regression Equations

The following section presents the assessment of multicollinearity in the two separate Cox regressions (EO/EO dimensions). This was similarly conducted among the panel regressions in chapters 7 and 8. The assessment of the multicollinearity is through the VIF and the regression correlation coefficients.

9.3.3.1 Multicollinearity Test through the VIF

The following section represents the multicollinearity testing through the variance inflation factor (VIF). The first table will outline the VIF values of the regression of EO as the predictor variable followed by the EO dimensions. If the VIF values were below 10 and regression correlation coefficients were below 0.8 then this indicates that there were no issues of multicollinearity (Gujarati, 2003).

Table 9.2: Variance Inflation Factor of the Cox Regression of EO

Variables	**VIF**	**1/VIF**
Firm age	1.58	0.634
Firm size	1.49	0.671
Firm age squared	1.28	0.779
Organisational Slack	1.13	0.883
Leverage	1.10	0.907
EO	1.10	0.911
Systematic Risk	1.06	0.941
Tobin's Q	1.05	0.955
Mean VIF	1.22	

Table 9.3: Variance Inflation Factor of the Cox Regression of the EO Dimensions

Variables	**VIF**	**1/VIF**
Firm age	1.71	0.585
Firm size	1.65	0.606
Risk taking	1.65	0.607
Proactiveness	1.31	0.765
Firm age squared	1.29	0.777
Innovativeness	1.25	0.799
Leverage	1.20	0.833
Systematic Risk	1.19	0.842
Organisational Slack	1.18	0.847
Tobin's Q	1.09	0.917
Mean VIF	1.35	

In table 9.2, the highest VIF value was for firm age which was 1.58 and the mean VIF was 1.22, which were below 10. Furthermore, the lowest tolerance value was 0.634, which was above 0.1.

In table 9.3, the highest VIF value was for firm age as well, which was 1.71 and the mean VIF was 1.35, which were below 10. Furthermore, the lowest tolerance value was 0.585, which was above 0.1. Thereby, this indicates that there were no issues of multicollinearity.

The below section will present the multicollinearity testing through the correlation coefficients of the variables of the Cox regression.

9.3.3.2 Multicollinearity Test through the Correlation Matrix

The following section will present the correlation matrix of the regressors to test for multicollinearity. The first table will present the correlation coefficients of the regression of EO as the predictor variable followed by the EO dimensions. It is important to note that for firm age, the correlation between the interaction term of firm age and its squared term is reduced by centering the firm age variable before squaring it (e.g. Haynes et al., 2014).

Table 9.4: Correlation Matrix of the Coefficients of the Regression of EO

Variables	EO	SysR	FirmSize	FirmAge	FirmAge^2	Lev	OrgSlack	Tobin's Q
EO	1							
SysR	-0.137	1						
FirmSize	0.257	0.061	1					
FirmAge	-0.006	0.123	-0.318	1				
FirmAge^2	-0.101	-0.018	-0.196	0.688	1			
Lev	-0.018	-0.048	-0.131	0.042	0.07	1		
OrgSlack	0.116	0.117	0.122	-0.074	-0.169	0.244	1	
Tobin's Q	-0.043	0.04	-0.003	0.072	0.067	0.009	0.126	1

Note: systematic risk was abbreviated as SysR, leverage as Lev, organisational slack as OrgSlack.

Table 9.5: Correlation Matrix of the Coefficients of the Regression of EO Dimensions

Variables	Innov	Proac	Risk	SysR	FirmSize	FirmAge	FirmAge$^{\wedge 2}$	Lev	OrgSlack	Tobin'sQ
Innov	1									
Proac	-0.148	1								
Risk	-0.153	-0.127	1							
SysR	0.092	0.001	-0.35	1						
FirmSize	0.239	0.113	0.302	-0.044	1					
FirmAge	-0.053	0.198	0.091	0.072	-0.27	1				
FirmAge$^{\wedge 2}$	0.022	0.081	-0.151	0.011	-0.219	0.657	1			
Lev	0.121	-0.181	-0.322	0.08	-0.232	-0.055	0.095	1		
OrgSlack	0.059	0.09	0.188	0.052	0.185	-0.022	-0.175	0.138	1	
Tobin'sQ	-0.132	0.123	0.110	-0.026	0.038	0.102	0.04	-0.064	0.155	1

Note: systematic risk was abbreviated as SysR, leverage as Lev, organisational slack as OrgSlack, innovativeness as innov, proactiveness as proac, and risk taking as risk.

The above tables 9.4 and 9.5 outline the correlation of the regression coefficients of the two Cox regressions, in which the main predictor variable in the first Cox regression is EO and in the second regression are the EO dimensions.

In table 9.4, the highest correlation was between firm size and firm age being -0.3. The variables firm size and EO had the second highest correlation being 0.25. Thereby, there were no issues of multicollinearity.

In table 9.5, the highest correlation was between risk taking, dimension of EO, and systematic risk being -0.35. The second highest correlation was between leverage and risk taking being -0.32. Thereby, this indicates that there were no issues of multicollinearity. Even though the correlations between the dimensions of EO were low, since proactiveness was transformed into a categorical variable, yet the EO dimensions were run in separate regressions similar to chapters 7 and 8.

The next section will outline the regression results of the effect of EO and each of its dimensions on the risk of failure in the sample of the 268 failed firms.

9.4 Cox Regression Full Failure Model Results

The following section outlines the Cox regression results including the main predictor variables of each of the EO dimensions as well as the aggregate EO construct. The below table 9.6 presents the results from the full failure model.

In table 9.6, model 1 shows the results of the control variables only. Model 2 shows the results of EO as well as the control variables. Model 3 shows the results of the innovativeness dimension of EO only. Model 4 shows the results of the proactiveness dimension of EO. Model 5 shows the results of the risk taking dimension of EO.

The results from the full failure model were conducted whilst requesting robust standard errors. Since this is a sample of heterogenous firms from different high-technology industries, then this heterogeneity might produce misleading estimations of the hazard function and thus produce biased standard errors in the cox regression model. Furthermore, since this is a panel data format, observations of each firm are correlated and pooling these observations without taking the dependence of the observations into account might lead to biased standard errors. To ensure robustness of the main results, then the robust standard errors were requested. Thus, this accounts for the dependence of the observations by aggregating the observations of each firm in the panel based on their firm identifier 'gvkey'. This technique is referred to as the population-averaged method. This technique is preferred since it does not make any assumptions about the nature of the dependence of the observations (Allison, 2010).

This technique is similar to the robust clustered variance estimator that was used in chapters 7 and 8. By requesting the robust standard errors the sandwich chi-square statistics, used to test the null hypothesis that all the covariates coefficients are equal to zero, would be much lower than the model based Wald statistics since they correct for dependence.

Table 9.6: Cox Regression Full Failure Model Results

	Model 1	Model 2	Model 3	Model 4	Model 5
Systematic Risk	0.267*** (1.307)	0.250*** (1.284)	0.260*** (1.298)	0.240*** (1.272)	0.106 (1.112)
Firm age	-0.704**** (0.494)	-0.810**** (0.445)	-0.708**** (0.493)	-0.623**** (0.536)	-0.760**** (0.467)
Firm age square	0.089 (1.093)	0.0815 (1.085)	0.085 (1.090)	0.100 (1.105)	0.031 (1.032)
Firm size	-0.452**** (0.636)	-0.425**** (0.653)	-0.379*** (0.685)	-0.360*** (0.698)	-0.430*** (0.650)
Leverage	0.317**** (1.374)	0.349**** (1.419)	0.326**** (1.386)	0.270**** (1.311)	0.276**** (1.319)
Organisational Slack	-0.720**** (0.486)	-0.689**** (0.502)	-0.686**** (0.503)	-0.653**** (0.520)	-0.656**** (0.518)
Tobin's Q	-0.564**** (0.569)	-0.588**** (0.555)	-0.586**** (0.556)	-0.535**** (0.585)	-0.519**** (0.595)
EO		1.061**** (2.890)			
EO*Time		-0.241**** (0.785)			
Innovativeness			0.122** (1.130)		
Proactiveness				0.719**** (2.053)	
Risk taking					1.879**** (6.550)
Risk taking*Time					-0.401**** (0.669)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Financial Crisis Dummies	Yes	Yes	Yes	Yes	Yes
Observations	4495 (3754 censored and 741 failure events)	3879 (3262 and 617 failure events)	4495 (3754 censored and 741 failure events)	4495 (3754 censored and 741 failure events)	3886 (3262 censored and 624 failure events)
Wald (Sandwich) Chi2 Statistics	390.882****	747.726****	443.160****	421.445****	579.424****

Hazard ratio statistics in parentheses
*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

In table 9.6 above, in all the models, the robust version of the Wald test, which is similar to the F-test in the panel regressions, indicates that the covariates of the models had a significant effect on firm failure (p<0.001).

Model 2 tested hypothesis *H4* on the effect of EO on the risk of firm failure. Model 3 tested hypothesis *H6c* on the effect of innovativeness on the risk of failure. Model 4 tested hypothesis *H7c* on the effect of proactiveness on the risk of failure. Lastly, model 5 tested *H8c* on the effect of risk taking dimension on the risk of firm failure.

Model 1 which included only the control variables indicates that the variables exhibit the hypothesised effects except for firm age. Systematic risk as hypothesised in chapter 6 had a significant positive effect on firm failure ($p<0.01$). One standard deviation increase in the squared term of systematic risk led to 30.7 % increase in the probability of failure. Firm size, as hypothesised, had a significant negative effect on firm failure ($p<0.001$). Firm size (log of employees) led to 36.4 % decrease in the probability of failure. Firm age (log of firm age) was shown to decrease the risk of failure by 50.6 % ($p<0.001$). The U-shaped effect of firm age on firm failure was not supported. Organisational slack had a significant negative effect on firm failure ($p<0.001$) such that it decreased firm failure by 51.4 %. Leverage led to a 37.4 % increase in firm failure ($p<0.001$). Tobin's Q had a significant negative effect on firm failure, in which one standard deviation increase in Tobin's Q led to a decrease in firm failure by 43.1 % ($p<0.001$).

In the second model, EO was included as the main predictor variable. According to the Cox regression results, one standard deviation in EO increased the risk of firm failure by a multiple of 2.89 ($p<0.001$). Thereby, hypothesis *H4* was supported. However, this effect was not proportional with time. Thereby, the EO*log(time) coefficient can inform the effect of EO at a chosen time. Thus, to obtain the effect of EO at any point in time then this equation was used (1.061-log(months)*0.241) (Allison, 2010). As for the control variable, systematic risk had a significant positive effect on firm failure ($p<0.01$). Tobin's Q and firm age and firm size had a significant negative effect on firm failure ($p<0.001$). Leverage had a significant positive effect on firm failure ($p<0.001$).

Model 3, which included only the innovativeness dimension of EO, reveals that innovativeness had a significant positive effect on firm failure ($p<0.05$). Thereby, hypothesis *H6c* was not supported. Systematic risk had a significant positive effect on firm failure ($p<0.01$). Firm age, Tobin's Q, and organisational slack had a significant negative effect on firm failure ($p<0.001$). Firm size had a significant negative effect on firm failure ($p<0.01$). Leverage had a significant positive effect on firm failure ($p<0.001$).

In model 4, proactiveness was the main predictor variable. According to the Cox regression results, proactiveness led to an increase in firm failure by a multiple of

2.053 (p<0.001). Thereby, hypothesis *H7c* was supported. Systematic risk had a significant positive effect on firm failure (p<0.01). Tobin's Q, firm age, and organisational slack had a significant negative effect on firm failure (p<0.001). Firm size had a significant negative effect on firm failure (p<0.01). Finally, leverage had a significant positive effect on firm failure (p<0.001).

In model 5, risk taking dimension of EO was the main predictor variable. According to the model results, risk taking had a significant positive effect on firm failure, in which risk taking increased the risk of firm failure by a multiple of 6.55 (p<0.001). Thereby, hypothesis *H8c* was supported. Firm age, organisational slack, and Tobin's Q led to a decrease in firm failure (p<0.001). Furthermore, firm size led to a decrease in firm failure (p<0.01). Leverage led to an increase in firm failure (p<0.001).

The next section will present the robustness results of the Cox regression results among the sample of failed firms.

9.5 Robustness Check of Full Failure Model

For ensuring robustness, the firms were also stratified based on their industrial classification. The results are shown below in table 9.7.

Table 9.7: Cox Regression Full Failure Model Robustness Results

	Model 1	Model 2	Model 3	Model 4	Model 5
Systematic Risk	0.292**** (1.340)	0.286**** (1.332)	0.287**** (1.333)	0.266**** (1.305)	0.141* (1.152)
Firm age	-0.705**** (0.494)	-0.802**** (0.448)	-0.707**** (0.493)	-0.623**** (0.536)	-0.742**** (0.476)
Firm age square	0.087 (1.091)	0.069 (1.072)	0.083 (1.087)	0.097 (1.102)	0.026 (1.027)
Firm size	-0.454**** (0.635)	-0.428**** (0.651)	-0.381*** (0.683)	-0.362*** (0.696)	-0.436*** (0.646)
Leverage	0.316**** (1.372)	0.347**** (1.415)	0.325**** (1.385)	0.268**** (1.308)	0.272**** (1.314)
Organisational Slack	-0.738**** (0.478)	-0.698**** (0.497)	-0.701**** (0.496)	-0.672**** (0.511)	-0.663**** (0.515)
Tobin's Q	-0.568**** (0.566)	-0.599**** (0.549)	-0.590**** (0.554)	-0.539**** (0.583)	-0.536**** (0.585)
EO		1.071**** (2.921)			
EO*Time		-0.244**** (0.783)			
Innovativeness			0.122** (1.130)		
Proactiveness				0.724**** (2.064)	
Risk taking					1.916**** (6.796)
Risk taking*Time					-0.409**** (0.664)
Financial Crisis Dummies	Yes	Yes	Yes	Yes	Yes
Observations	4495	3879	4495	4495	3886
Wald (Sandwich) Chi2 Statistics	354.320****	627.126****	394.947****	387.588****	573.367****

Hazard ratio statistics in parentheses
*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

The Wald test in the models showed that the covariates had a significant effect on firm failure (p<0.001).

Model 2 tested hypothesis *H4* on the effect of EO on the risk of firm failure. Model 3 tested hypothesis *H6c* on the effect of innovativeness on the risk of failure. Model 4 tested hypothesis *H7c* on the effect of proactiveness on the risk of firm failure. Model 5 tested *H8c* on the effect of risk taking on the risk of firm failure.

According to the table 9.7 above, model 1, which included only the control variables showed that systematic risk had a significant positive effect on firm failure ($p<0.001$). Similarly, leverage had a significant positive effect on firm failure ($p<0.001$). Firm size, firm age, organisational slack, and Tobin's Q had a significant negative effect on firm failure ($p<0.001$).

In model 2, which included EO as the main predictor variable, showed that EO had a significant positive effect on firm failure. EO increased the risk of failure by a multiple of 2.92 ($p<0.001$). This validated hypothesis *H4*. As for the control variables, firm size, firm age, organisational slack, and Tobin's Q had a significant negative effect on firm failure ($p<0.001$). Systematic risk and leverage had a significant positive effect on firm failure ($p<0.001$). Furthermore, the lagged value of EO showed that it increased the risk of firm failure by a multiple of 2.125 ($p<0.001$).

Model 3, which included innovativeness, showed that innovativeness had significant positive effect on firm failure ($p<0.05$). Thereby, hypothesis *H6c* was not supported. As for the control variables, systematic risk and leverage had a significant positive effect on firm failure ($p<0.001$). Firm age, organisational slack, and Tobin's Q had a significant negative effect on firm failure($p<0.001$). Lastly, firm size had a significant negative effect on firm failure ($p<0.01$).

In model 4, which included proactiveness, showed that proactiveness had a significant positive effect on firm failure, in which it increased the risk of failure by a multiple of 2.06 ($p<0.001$). Thereby, hypothesis *H7c* was supported. Systematic risk and leverage had a significant positive effect on firm failure ($p<0.001$). Firm size ($p<0.001$), firm age ($p<0.001$), Tobin's Q ($p<0.001$), and organisational slack ($p<0.001$) had a significant negative effect on firm failure.

In model 5, which included risk taking, indicated that risk taking had a significant positive effect on firm failure, in which risk taking increased the risk of failure by a multiple of 6.79 ($p<0.001$). Thereby, hypothesis *H8c* was supported. Organisational slack, firm age, and Tobin's Q had a significant negative effect on firm failure ($p<0.001$). Firm size had a significant negative effect on firm failure ($p<0.01$). Lastly, leverage had a significant positive effect on firm failure ($p<0.001$).

The next section will outline the separate failure model results of the separate samples of failed firms: mergers and acquisitions (M&A), bankruptcy or liquidity, and privatisation (no longer filing with the SEC). Thus, the next section will present the competing risks model, which considers different modes of exit, in which the hypotheses were further tested exclusively on the firms that failed due to merger and acquisition, bankruptcy and liquidity, and privatisation (Wagner & Cockburn, 2010).

9.6 Separate Failure Groups of Firms' Cox Regression Results

The following section represents the Cox regression results of the different failure groups of firms, which were separated into firms that failed due to merger and acquisition in table 9.8, liquidity and bankruptcy in table 9.9, and lastly those due to other reasons (becoming a private company or no longer filing with SEC) in table 9.10. In each of the different tables 9.8, 9.9, and 9.10, there are five models similar to the previous models examined earlier in the main results and robustness sections.

In the thesis sample of firms, 357 firms were subjected to a merger and acquisition. After the Z-score classification, 224 firms were left and were considered as failed due to a merger or acquisition. Thereby, most of the firms in the sample failed due to reason of merger or acquisition (224 firms). Furthermore, 16 firms failed due to liquidity or bankruptcy and lastly 28 firms failed due privatisation. Examples of firms that failed due to merger and acquisition are: ADC telecommunications, EMC technologies inc, Intergraph corp, Msc software corp, Printronix inc, Infinium software inc, and Sensormatic electronics. Examples of firms that failed due to liquidity and bankruptcy are: Energy conversion Devices, Sheldahl inc, Three-five systems inc, Trident microsystems inc, Lodgenet interactive corp, Evergreen solar inc, and Astropower inc. Examples of firms that failed due to privatisation are: Innovex inc, Dell inc, Trinsic inc, Powerwave technologies inc, Saba software inc, Silicon graphics inc, and Sento corp.

Firms that failed due to merger or acquisition were exhibited among all the high-technology industries in the overall sample. Firms that failed due to bankruptcy or liquidity were present only in the communication equipment, communication services, software, electronics, and computer hardware industries. Similarly, firms that failed due to privatisation, were present among the software, electronics, communication equipment, computer hardware, telephone equipment, and measuring and controlling devices. One high-technology dummy was removed from the analysis for multicollinearity reasons and for avoiding the dummy-variable trap (Cameron & Trivedi, 2010).

The first table will present the Cox regression results of the effects of EO and its dimensions on the risk of failure in the sample of failed firms due to merger or acquisition.

Table 9.8: Failure due to Merger and Acquisition

	Model 1	Model 2	Model 3	Model 4	Model 5
Systematic Risk	0.286**** (1.332)	0.295**** (1.344)	0.280**** (1.324)	0.258*** (1.295)	0.196** (1.217)
Firm age	-0.814**** (0.443)	-0.929**** (0.395)	-0.817**** (0.442)	-0.745**** (0.475)	-0.913**** (0.401)
Firm age square	0.041 (1.042)	0.022 (1.023)	0.038 (1.039)	0.050 (1.052)	-0.011 (0.989)
Firm size	-0.402**** (0.669)	-0.393*** (0.675)	-0.338*** (0.713)	-0.321*** (0.725)	-0.449**** (0.638)
Leverage	0.268**** (1.308)	0.298**** (1.348)	0.276**** (1.319)	0.227**** (1.256)	0.263**** (1.301)
Organisational Slack	-0.687**** (0.503)	-0.658**** (0.517)	-0.657**** (0.518)	-0.629**** (0.533)	-0.663**** (0.515)
Tobin's Q	-0.561**** (0.570)	-0.582**** (0.559)	-0.580**** (0.560)	-0.535**** (0.586)	-0.532**** (0.587)
EO		1.006**** (2.737)			
EO*Time		-0.230**** (0.794)			
Innovativeness			0.107* (1.114)		
Proactiveness				0.625**** (1.869)	
Risk taking					1.713**** (5.546)
Risk taking*Time					-0.389**** (0.677)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Financial Crisis Dummies	Yes	Yes	Yes	Yes	Yes
Observations	4495 (3780 censored and 715 events)	3879 (3275 censored and 604 events)	4495 (3780 censored and 715 events	4495 (3780 censored and 715 events	3886 (3275 censored and 611 events
Wald (Sandwich) Chi2 Statistics	332.120****	658.036****	382.765****	366.221****	457.247****

Hazard ratio statistics in parentheses. *p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

Table 9.8 above represents the Cox regression results in the sample of firms that failed due to merger or acquisition. Model 2 tested hypothesis *H4* on the effect of EO on the risk of organisational failure. Model 3 tested hypothesis *H6c* on the effect of innovativeness on the risk of firm failure. Model 4 tested hypothesis *H7c* on the effect of proactiveness on the risk of firm failure. Lastly, model 5 tested *H8c* on the effect of risk taking on the risk of firm failure.

In the first model, which only included the control variables, systematic risk and leverage were shown to have a significant positive effect on firm failure ($p<0.001$). Firm age, firm size, organisational slack, and Tobin's Q ($p<0.001$) were shown to have a significant negative effect on firm failure ($p<0.001$).

In model 2, which included EO as the main predictor variable, EO was shown to have a significant positive effect on firm failure, in which EO increased risk of failure (of merger and acquisition) by a multiple of 2.73. Thereby, hypothesis *H4* was supported. As for the control variables, firm age, organisational slack, and Tobin's Q were both shown to have a negative effect on the risk of firm failure ($p<0.001$). Firm size was shown to have a significant negative effect on firm failure ($p<0.01$). Systematic risk and leverage were shown to have a significant positive effect on firm failure ($p<0.001$).

Model 3, in which the innovativeness dimension was included, revealed that innovativeness had an insignificant effect on firm failure at the 5% level. Thereby hypothesis *H6c* was not supported. Firm age, organisational slack, and Tobin's Q were shown to have a significant negative effect on firm failure ($p<0.001$). Firm size was also shown to have a significant negative effect on failure ($p<0.01$). Lastly, systematic risk and leverage were both shown to have a significant positive effect on firm failure ($p<0.001$).

Model 4, which included proactiveness, showed that proactiveness has a significant positive effect on firm failure, in which it increases the risk of firm failure (of merger and acquisition) by 86.9 % ($p<0.001$). Thereby, hypothesis *H7c* was supported. Systematic risk was shown to have a significant positive effect on firm failure ($p<0.01$). Leverage had a significant positive effect on firm failure ($p<0.001$). Firm size was shown to have a significant negative effect on firm failure (p<0.01). Lastly, organisational slack, firm age, and Tobin's Q were shown to have a significant negative effect on firm failure (p<0.001).

Model 5, which included risk taking dimension of EO only, indicated that risk had a significant positive effect on firm failure by merger and acquisition (p<0.001), such that risk taking increased the risk of failure by a multiple of 5.54. Thereby, hypothesis *H8c* was supported. Systematic risk (p<0.05) and leverage (p<0.001) were shown to increase the risk of firm failure significantly. Conversely, Tobin's Q, firm size, firm age, and organisational slack were shown to decrease the risk of failure significantly (p<0.001). The next section will outline the regression results of firms that failed to bankruptcy or liquidity.

Table 9.9: Failure due to Bankruptcy and Liquidity

	Model 1	Model 2	Model 3	Model 4	Model 5
Systematic Risk	0.127 (1.136)	0.117 (1.125)	0.129 (1.139)	0.110 (1.117)	-0.228 (0.796)
Firm age	-0.283 (0.753)	-0.232 (0.793)	-0.350 (0.704)	-0.217 (0.805)	-0.088 (0.915)
Firm age square	0.102 (1.107)	0.184 (1.202)	0.066 (1.069)	0.119 (1.127)	0.104 (1.110)
Firm size	-1.436**** (0.238)	-1.495**** (0.224)	-1.550**** (0.212)	-1.389**** (0.249)	-1.435**** (0.238)
Leverage	0.486**** (1.626)	0.541**** (1.719)	0.459**** (1.583)	0.455**** (1.578)	0.388*** (1.474)
Organisational Slack	0.148 (1.161)	0.029 (1.030)	0.104 (1.110)	0.173 (1.189)	0.129 (1.138)
Tobin's Q	-0.767**** (0.464)	-1.073**** (0.342)	-0.715**** (0.489)	-0.734**** (0.480)	-0.885**** (0.413)
EO		0.772** (2.164)			
EO*Time		-0.156** (0.855)			
Innovativeness			-0.229 (0.795)		
Proactiveness				0.410 (1.508)	
Risk taking					2.346**** (10.448)
Risk taking*Time					-0.443**** (0.642)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Financial Crisis Dummies	Yes	Yes	Yes	Yes	Yes
Observations	4495 (4432 censored and 63 events)	3879 (3827 censored and 52 events)	4495 (4432 censored and 63 events)	4495 (4432 censored and 63 events)	3886 (3834 censored and 52 events)
Wald Chi2 Statistics	146.255****	150.989****	148.536****	146.043****	177.456****

Hazard ratio statistics in parentheses. *p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

In table 9.9 above, model 2 tested hypothesis *H4* on the effect of EO on the risk of failure. Model 3 tested hypothesis *H6c* on the effect of innovativeness on the risk of failure. Model 4 tested hypothesis *H7c* on the effect of proactiveness on the risk of firm failure. Model 5 tested *H8c* on the effect of risk taking on the risk of firm failure.

Model 1 outlines the results of the control variables. It revealed that firm size and Tobin's Q had a significant negative effect on firm failure ($p<0.001$). Leverage had a significant positive effect on firm failure ($p<0.001$).

Model 2, which included EO as the main predictor variable, showed that EO had a significant positive effect on firm failure (by bankruptcy or liquidity), in which EO increased the risk of failure by a multiple of 2.16 ($p<0.05$). Thereby, hypothesis *H4* was supported. The control variables firm size and Tobin's Q had a significant negative effect on firm failure ($p<0.001$). Leverage had a significant positive effect on firm failure ($p<0.001$).

In model 3, which included innovativeness dimension, it was revealed that innovativeness had an insignificant effect on the risk of failure. Thereby, hypothesis *H6c* was not supported. Firm size and Tobin's Q had a significant negative effect on failure ($p<0.001$). Leverage had a significant positive effect on failure ($p<0.001$).

In model 4, which included the proactiveness dimension, it was shown that proactiveness had an insignificant effect on firm failure. Thereby, hypothesis *H7c* was not supported. Firm size and Tobin's Q had a significant negative effect on failure ($p<0.001$). Leverage had a significant positive effect on firm failure ($p<0.001$).

In the final model, which included risk taking, risk taking had a significant positive effect on firm failure (of bankruptcy or liquidity) by a multiple of 10.44 ($p<0.001$). Thereby hypothesis *H8c* was supported. Firm size and Tobin's Q had a negative effect on failure ($p<0.001$). Leverage had a significant positive effect on failure ($p<0.01$). The next table will outline the regression results of the sample of firms that failed due to privatisation.

Table 9.10: Failure due to Privatisation

	Model 1	Model 2	Model 3	Model 4	Model 5
Systematic Risk	0.161 (1.175)	-0.178 (0.836)	0.201 (1.223)	0.199 (1.221)	-0.321 (0.725)
Firm age	-0.633*** (0.531)	-0.766** (0.465)	-0.7004*** (0.496)	-0.517** (0.596)	-0.586* (0.556)
Firm age square	-0.266 (0.766)	-0.258 (0.772)	-0.260 (0.771)	-0.231 (0.793)	-0.389 (0.677)
Firm size	-0.540*** (0.583)	-0.270 (0.763)	-0.252 (0.777)	-0.379* (0.684)	-0.153 (0.858)
Leverage	0.488**** (1.630)	0.475**** (1.609)	0.491**** (1.634)	0.396**** (1.487)	0.248* (1.282)
Organisational Slack	-1.960**** (0.141)	-1.850**** (0.157)	-1.990**** (0.137)	-1.834**** (0.160)	-1.423*** (0.241)
Tobin's Q	-0.551*** (0.576)	-0.482* (0.617)	-0.714**** (0.489)	-0.528*** (0.589)	-0.317 (0.728)
EO		1.256**** (3.514)			
EO*Time		-0.223*** (0.800)			
Innovativeness			0.465**** (1.593)		
Proactiveness				1.203*** (3.330)	
Risk taking					3.432**** (30.947)
Risk taking*Time					-0.602**** (0.548)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Financial Crisis Dummies	Yes	Yes	Yes	Yes	Yes
Observations	4495 (4441 censored and 54 events)	3879 (3840 censored and 39 events)	4495 (4441 censored and 54 events)	4495 (4441 censored and 54 events)	3886 (3847 censored and 39 events)
Wald Chi2 Statistics	159.098****	146.508****	162.999****	153.074****	143.553****

Hazard ratio statistics in parentheses
*p<0.1, ** p<0.05, *** p<0.01, **** p<0.001

In table 9.10, which outlines the results of failure due to privatisation, model 2 tested hypothesis *H4* on the effect of EO on the risk of firm failure. Model 3 tested hypothesis *H6c* on the effect of innovativeness on the risk of firm failure. Model 4 tested hypothesis *H7c* on the effect of proactiveness on the risk of firm failure. Lastly, model 5 tested *H8c* on the effect of risk taking on the risk of firm failure.

Model 1 indicated that firm age, firm size, and Tobin's Q had a significant negative effect on firm failure (p<0.01). Organisational slack had a significant negative effect on firm failure (p<0.001). Leverage had a significant positive effect on firm failure (p<0.001).

Model 2, which included EO, showed that EO had a significant positive effect on failure ($p<0.001$), in which EO increased the risk of firm failure (privatisation) by a multiple of 3.51. Thereby, hypothesis *H4* was supported. Organisational slack ($p<0.001$) and firm age ($p<0.05$) had a significant negative effect on firm failure. Leverage had a significant positive effect on firm failure ($p<0.001$).

Model 3, which included innovativeness only, indicated that innovativeness had a significant positive effect on the risk of failure by privatisation, in which it increased the risk of failure (by privatisation) by 59.3 %. Thereby, hypothesis *H6c* was not supported. Firm age ($p<0.01$), organisational slack ($p<0.001$), and Tobin's Q ($p<0.001$) had a significant negative effect on firm failure. Leverage had a significant positive effect on firm failure ($p<0.001$).

In model 4, which included proactiveness dimension, it was shown that proactiveness had a significant positive effect on firm failure (by privatisation), in which it increased the risk of failure by a multiple of 3.33 ($p<0.01$). Thereby, hypothesis *H7c* was supported. Firm age ($p<0.05$), organisational slack ($p<0.001$), and Tobin's Q ($p<0.01$) had a significant negative effect on firm failure. Leverage had a significant positive effect on firm failure ($p<0.001$).

In the last model, which included risk taking, it was shown that risk taking had a significant positive effect on firm failure (by privatisation) in which risk increased the chances of failure of firms by a multiple of 30.9 ($p<0.001$). Thereby, hypothesis *H8c* was supported. Organisational slack decreased the risk of failure ($p<0.01$).

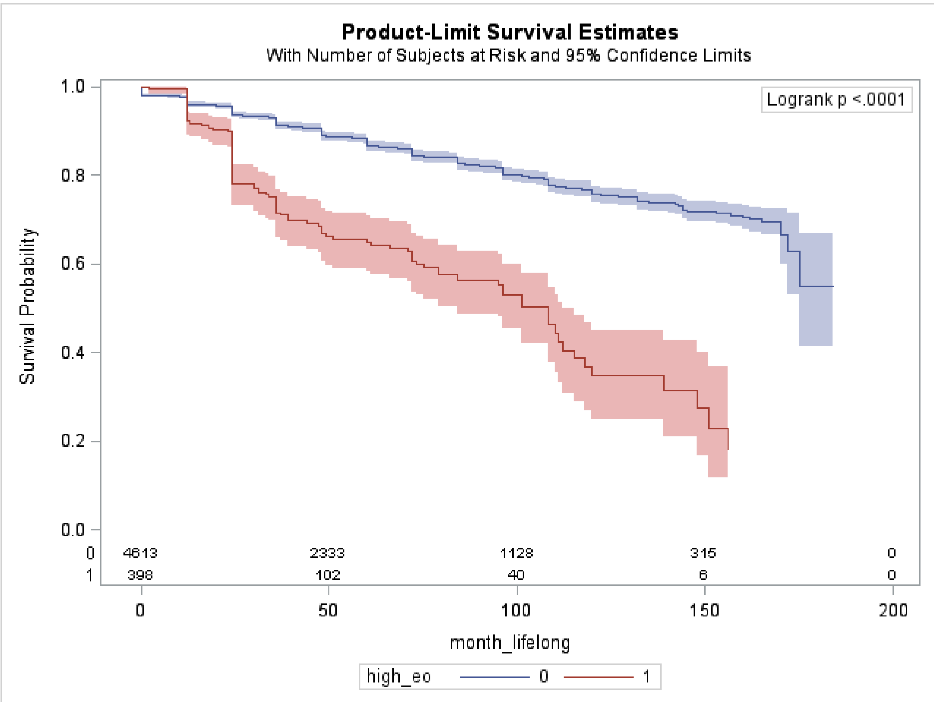
The next section will outline the survival graph results of the effects of the high levels of EO and its dimensions on the survival rate of the sample of firms. The following section is outlined to further address hypotheses *H4*, *H6c*, *H7c*, and *H8c*.

9.7 Effect of Top and Bottom 25% values of EO and its Dimensions on Firms' Survival

The following section represents the effect of the top and bottom values of EO and its separate dimensions on the firms' survival. In the sample of firms, EO ranged from -28.8 to 8.7 among the sample of firms. Thus, EO was segregated into low and high exhibition of EO based on one standard deviation above the mean for the top 25% and one standard deviation below the mean for the bottom 25% as well as separating the variables into 4 quantiles to represent the top 25 % values and bottom 25 % values (e.g. Campbell et al., 2012; Haynes et al., 2014). Similar to EO, proactiveness had a large standard deviation ranging from values of -7.11 to 0.97. Innovativeness and risk taking had a lower standard deviation and less variation in the sample of firms.

The 'Kaplan-Meier product-limit estimates' of the survival functions of the sample of firms were used to compare the different values of each of the main predictor variables on firm survival, a method that was also utilised for examining the survival probability of the high-technology industry as shown above in section 9.2. Below are the figures of low/high EO and each of its dimensions' effects on firm survival probability to further test hypotheses *H4*, *H6c*, *H7c*, and *H8c*.

Figure 9.23: The Effect of High EO on Firm Survival

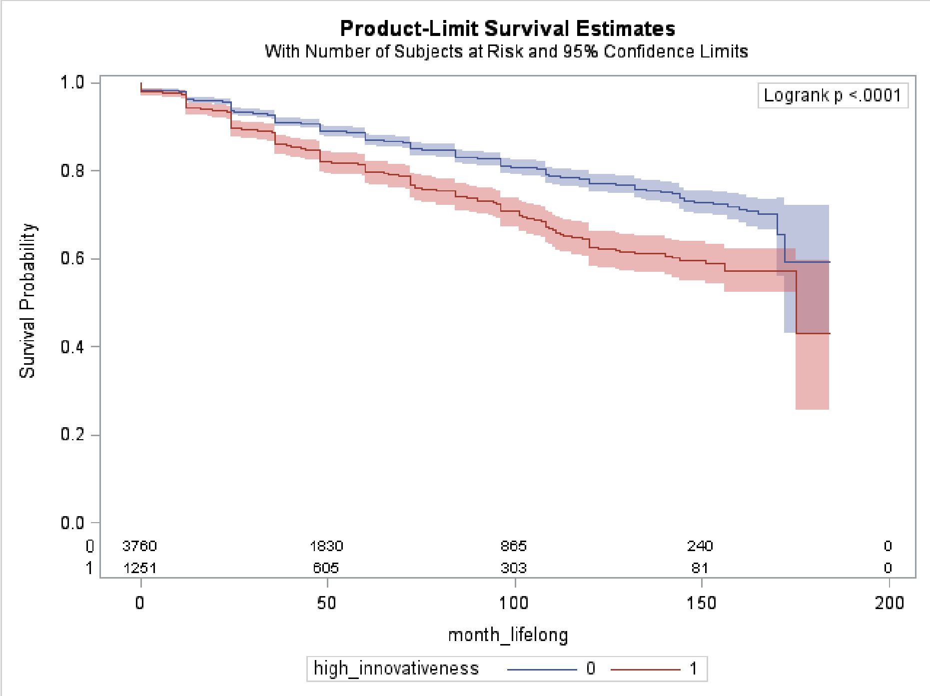


The above figure 9.23 tested for *H4*, in which the hypothesis stated that the relationship between EO and the risk of firm failure is positive over time.

In the above figure 9.23, firms with a higher level of EO exhibited a higher probability of failure. Thus, the red line which represents high values of EO (top

25% in the sample) had a significantly less survival probability (p-value<0.0001) than firms with lower levels of EO. Thereby, hypothesis *H4* was supported. As seen in the figure, the failure rate of firms that exhibited high levels of EO increased as the time factor increased. Thereby, as shown in the figure, the effect of EO was not proportional with time. The results of the graphic representation of the effect of high levels of EO aligned with organisational learning theory. Most of the firms in this sample were in the software industry.

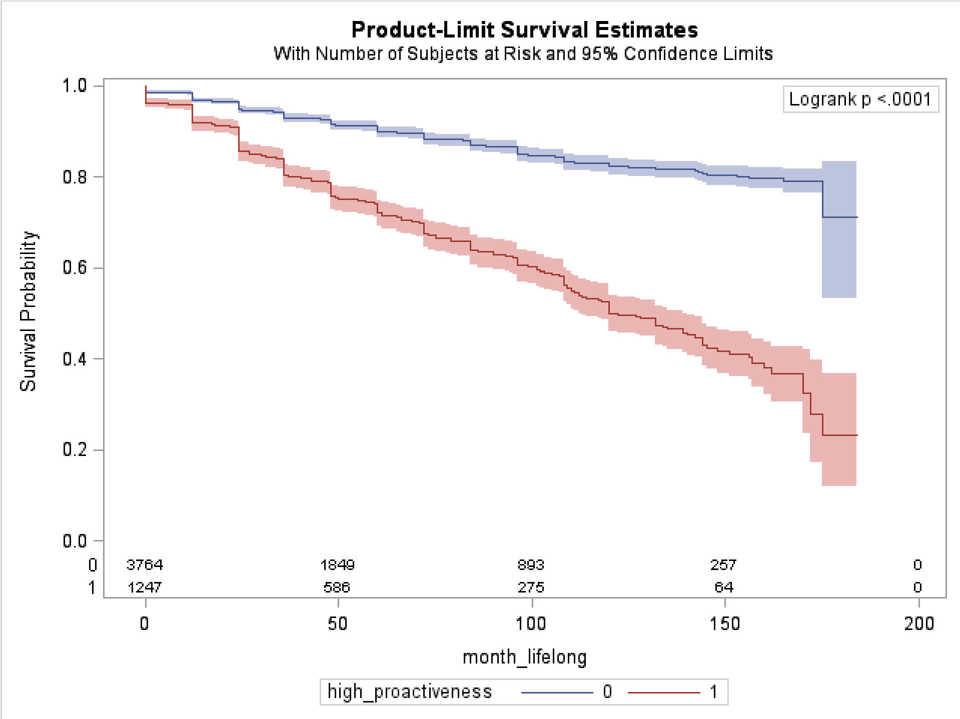
Figure 9.24: The Effect of High Innovativeness on Firm Survival



The above figure 9.24 tested for *H6c*, in which the hypothesis stated that innovativeness decreases the risk of failure.

In the above figure 9.24, firms with a higher level of innovativeness had less of a probability of survival (p-value<0.001). Thereby, hypothesis *H6c* was not supported. Most of the firms were in the software and electronics industries.

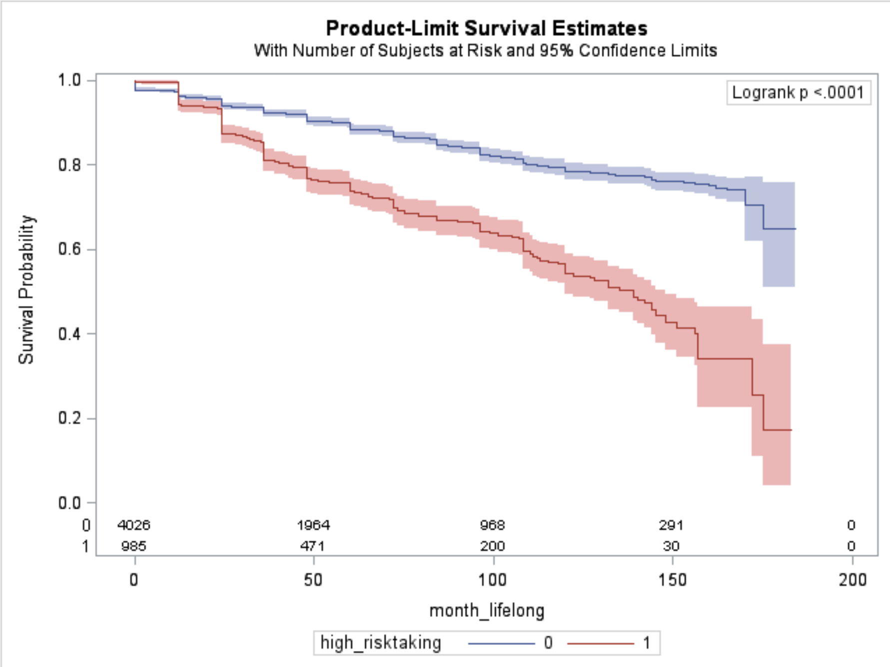
Figure 9.25: The Effect of High Proactiveness on Firm Survival



The above figure 9.25 tested for *H7c*, in which the hypothesis stated that proactiveness increased the risk of failure.

In the above figure 9.25, firms with higher levels of proactiveness exhibited a higher probability of failure as well (top 25% in the sample). Thereby, hypothesis *H7c* was supported. Firms that were more proactive had a significantly less survival probability (p-value<0.0001). Most of the firms in this sample were in the software, electronics, and measuring and controlling devices industries.

Figure 9.26: The Effect of High Risk taking on Firm Survival



The above figure 9.26 tested for *H8c*, in which the hypothesis stated that risk taking has a positive effect on the risk of failure.

In the above figure 9.26, firms with higher levels of risk exhibited a significantly higher probability of failure (top 25% in the sample) (p-value<0.0001) than firms with lower values of risk taking. Thereby, hypothesis *H8c* was supported. Most of the firms in this sample were in software, electronics, communication equipment and computer hardware industries.

9.8 Chapter Conclusion

The survival analysis results revealed that EO and each of its dimensions innovativeness, proactiveness, and risk taking had a significant positive effect on the risk of firm failure in the overall sample of failed firms.

Specifically, in the overall sample of failed firms, EO had a significant positive effect on firm failure, supporting *H4*. Innovativeness was shown to increase firm failure, not supporting *H6c*, proactiveness was shown to have a positive effect on firm failure, supporting *H7c*, and risk taking was shown to have a positive effect on firm failure in support of *H8c*.

Among the sample of firms that failed due to merger and acquisition, EO was shown to increase firm failure supporting *H4*. Innovativeness had an insignificant effect on failure, not in support of *H6c*. Proactiveness was shown to increase firm failure supporting *H7c*. Risk taking was shown to increase firm failure supporting *H8c*.

In the sample of firms that failed due to bankruptcy, it was shown that EO increased the risk of failure supporting *H4*. Innovativeness and proactiveness had an insignificant effect on failure, not in support of *H6c* and *H7c.* Risk taking increased the risk of failure, supporting *H8c*.

In the sample of firms that failed due to privatisation, EO and its dimensions proactiveness and risk taking increased the risk of firm failure supporting *H4*, *H7c*, and *H8c* respectively. Whereas innovativeness was shown to increase firm failure, not in support of *H6c*.

The high-technology industry was shown to have a lower survival probability in comparison to other industries supporting *H5*.

The next chapter will be the discussion section of the results of Study 1 (chapter 7 and 8) and Study 2 (chapter 9).

Chapter 10

Discussion of Results

10.1 Introduction to the Chapter

Entrepreneurial orientation (EO) has gained an accelerating and broadening exponential interest in recent years. Literature has undisputedly considered that EO is advantageous to a firm's performance (Gupta & Dutta, 2016; Wales, 2016). However, recent research has not captured the dangers of entrepreneurial behaviours that could result in total losses and not necessarily generate economic returns (i.e. EO-as-Experimentation) (Wales, 2016; Wales et al., 2013c). Even so, researchers are calling to move away from the EO-as-Experimentation perspective (Eshima & Anderson, 2017).

Few have questioned or challenged the notion that EO leads to improved firm performance, and the majority of researchers universally accept that EO is advantageous on firm performance (i.e. EO-as-advantage perspective) (Andersén, 2010). This thesis focuses on the possible organisational outcomes that arise from an entrepreneurial orientation by considering the alternative perspective of the EO-firm performance relationship, which is the EO-as-Experimentation perspective (Wiklund & Shepherd, 2011).

To test the EO-as-Advantage versus the EO-as-Experimentation perspectives, this research utilises objective panel data to examine the effects of EO and its dimensions (innovativeness, proactiveness, and risk taking) on several firm performance measures over time. Most importantly, this research also examines the effect of EO and each of its dimensions on the risk of failure along a longitudinal timeframe. When assessing the effects of EO and each of its dimensions on important organisational outcomes, this research has aimed to address the literature gaps (conceptualisation-measurement misalignment, survivor bias, cross-sectional bias, testing value of EO against short-term measures of performance, and bundling the various dimensions of EO into a gestalt index). This chapter addresses the empirical findings from Study 1, which objectively examined the effects of EO and its dimensions on firm performance over time and Study 2, which examined the effects of EO and its dimensions on probability of firm failure. The chapter in turn emphasises the contributions this thesis offers to the literature.

The chapter will begin with a reminder for the reader of the literature gaps followed by the ways in which this thesis addresses the mentioned gaps. The chapter will then discuss the analysis results of Study 1 and Study 2.

10.2 Addressing the Literature Gaps

The literature has been biased by a conceptualisation-measurement misalignment, in which researchers measure EO using EO scales that reflect managerial opinions, yet EO was initially conceptualised as a firm-level behaviour (Miller, 1983). The literature has also been subject to a survivor bias, in which the majority of EO researchers examine the effect of EO among a sample of active or surviving firms (Rauch et al., 2009). Furthermore, a major study design limitation is that most studies on EO conduct a cross-sectional examination of the effect of EO (e.g. Lomberg et al., 2016). Thus, the effect of EO over time has been disregarded. The literature has been also biased by testing the effect of EO on short-term measures of firm performance, ignoring its impact on long-term firm value (Gupta & Wales, 2017). Another limitation is that the gestalt conceptualisation, in which researchers combine the various dimensions of EO into an index, has been the predominant stance (Wales, 2016). This masks the independent effects of each of the EO dimensions (e.g. Hughes & Morgan, 2007).

This thesis addressed the aforementioned gaps. To address the conceptualisation-measurement misalignment, the thesis measured EO through objective secondary proxies, which reflect the behavioural outcomes or actions of the firm (Miller & Le Breton-Miller, 2011). Surprisingly, secondary measures of EO have not been widely used in comparison to the established psychometric approach (i.e. the EO scale) (Wales, 2016). The adoption of objective measures does not only avoid the conceptualisation-measurement problem, but it also gets rid of common method bias and response and subjectivity bias of the survey design (Gupta & Gupta, 2015; Short et al., 2010). To address the survivor bias, this thesis included a sample of failed firms and conducted a separate analysis of the EO-firm performance relationship among the surviving firms versus the failed firms (Wiklund & Shepherd, 2011). The examination of the EO-firm performance relationship among the sample of failed firms provided insight into the dangers associated with EO and revealed new theoretical revelations into the possible outcomes from EO. To address the cross-sectional design problem, this thesis examined the longitudinal effect of EO and each of its dimensions on firm performance from the pre-crisis (fiscal year 2000) until the post-crisis period (fiscal year 2014). The dependent variable problem was addressed by including various indicators of firm performance to test the value of EO on short-term performance (through ROA) as well as long-term performance (through Tobin's Q). The thesis also examined the effect of EO on the long-term viability of a business (risk of firm failure). By considering several performance indicators (i.e. multi-dimensional nature of firm performance), researchers can assess and compare the value of EO against specific indicators (Gupta & Wales, 2017). To address the dominance of the gestalt conceptualisation of EO, we examined the various effects of the EO dimensions on different performance indicators as well as on firm viability. As a result, the theoretical implications of the effects of each of the EO dimensions on the different measures of firm-level outcomes could be tested.

This research aimed to challenge the over-arching positive effect of EO on a firm's performance by answering the questions on the effect of EO on firm performance as well as firm failure within the theoretical framework of organisational learning theory and prospect theory. Following the Rauch et al. (2009) meta-analysis, research has taken for granted the positive impact of EO on a firm's performance and this can be shown by the recent works of Shahzad et al. (2016) and Mthanti and Ojah (2017). However, recent studies have found that EO positively moderates the relationship between family involvement and risk of failure (Revilla et al., 2016) and that the positive effect of EO decreases over time (Gupta & Gupta, 2015). To address this inconsistency, within the theoretical framework, 8 hypotheses were developed and tested relating the effect of EO and each of its dimensions on firm performance (Tobin's Q and ROA) and failure.

The next sections will provide a discussion of the results of the effects of EO and each of its dimensions on firm performance and risk of failure.

10.3 Study 1: Longitudinal Effect of EO and its Dimensions on Firm Performance

This section discusses the results from Study 1, which examined the longitudinal effect of EO and its dimensions on firm performance measures (ROA and Tobin's Q) among the samples of surviving and failed firms.

10.3.1 Longitudinal Effect of EO on Firm Performance among Surviving and Failed Firms

This research argued that EO aligns more with the EO-as-Experimentation perspective, which was first outlined by Wiklund and Shepherd (2011), even though most of the literature has provided evidence supporting the EO-as-Advantage perspective (Rauch et al., 2009). We provided an argument for and found empirical evidence that the current research might not be capturing the double-edged sword nature of EO.

Drawing theoretical insights from organisational learning theory, this research found that the effect of EO on a firm's performance aligned more with the EO-as-Experimentation perspective. Wiklund and Shepherd (2011) considered that EO is an exploratory type of behaviour, which is characterised by experimenting and delving into endeavours that are far from a firm's competencies. This characterisation of experimentation held within EO has the possibility to increase variation in outcomes, in which such endeavours may either enhance a firm's performance or conversely might decrease it to below the minimum performance level needed for survival (Wiklund & Shepherd, 2011). This characteristic or nature of EO is then shaped as a double-edged sword (Patel et al., 2015). Furthermore, according to prospect theory, EO is a risk-producing strategy (Swift, 2016). Myopic loss aversion within prospect theory predicts that, since an entrepreneurial orientation is characterised by being a long-term orientation and whose value is assessed less frequently in comparison to short-term decisions, firms are more likely to be risk-oriented towards entrepreneurial behaviours (Benartzi & Thaler, 1995; Swift, 2016).

Study 1, which focused on the longitudinal effect of EO and its dimensions on a firm's performance, argued based on organisational learning theory, that in a sample of surviving firms EO enhanced a firm's performance until a threshold point, but beyond that threshold a firm's performance decreased. Organisational learning theory builds on the distinction of explorative and exploitative behaviours and considers EO to be more of an explorative risky behaviour (Wiklund & Shepherd, 2011). When firms focus more on explorative endeavours at the expense of exploitative predictable behaviours (i.e. a higher EO level), this leads to a higher possibility of a negative outcome occurring (March, 1991, 2006). Thereby, in a sample of surviving firms, we initially argued and found that EO has an inverse U-shaped effect on a firm's performance.

In certain contexts (Chinese firms or small firms), it has been shown that EO has an inverse U-shaped effect on a firm's performance (Tang et al., 2008; Wales et al., 2013c). That is, even though the literature agrees that EO generally leads to a positive effect on a firm's performance, in some contexts (i.e. small firms), at higher levels of EO, the positive effect on performance starts to diminish (Wales et al., 2013c). We argue that the question of whether the potential benefits of pursuing EO outweigh its costs is context-dependent (Wales et al., 2013c). However, that context in this thesis is not firm-dependent (e.g. Wales et al., 2013c) or country-dependent (e.g. Tang et al., 2008), but it is survivor-dependent (Wiklund & Shepherd, 2011). According to the results of Study 1, it was shown that indeed EO had an inverse U-shaped effect on a firm's performance (short-term and long-term measures). Yet, the inverse U-shaped effect was predominantly a negative effect as the linear and the quadratic terms of EO were both significantly negative.

The literature has captured the positive impact of EO on a firm's performance since it focused on a sample of surviving firms and typically with cross-sectional studies (Rauch et al., 2009). We argue based on the EO-as-Experimentation perspective that in the sample of failed firms, EO has a negative effect on a firm's performance and may be thought of as a contributory factor to that failure. Failed firms are likely to be more entrepreneurially oriented and firms that put more of an emphasis on EO are likely to suffer from higher costs of engaging in risky entrepreneurial behaviours (March, 1991). It was shown in chapter 8 that in the sample of failed firms, EO had a significant negative effect on a firm's performance (short-term and long-term measures). These results challenge the EO-as-Advantage perspective and most of the studies on EO. The results have clear implications for further theoretical considerations in examining the longitudinal EO and firm performance relationship rather than taking for granted its positive effect.

Lastly, using insights from organisational learning and prospect theory, we argue that as EO increases its effect on firm performance becomes more negative among surviving firms. At lower levels of EO, it signifies firms pursuing a less risky incremental innovative entrepreneurial strategy. Thereby, EO at lower levels should be less resource-intensive and less risky and would enhance a firm's performance (Wales et al., 2013c, Wiklund & Shepherd, 2011). As EO increases, the costs are likely to outweigh its benefits as EO represents an over-reliance on bold moves and experimental gambles to explore and seek opportunities (Mintzberg, 1973; Patel et al., 2015). Furthermore, as EO increases, firms are more likely to pursue radical and dramatic innovative strategies in comparison to incremental innovations (Swift, 2016; Wales et al., 2013c). Atuahene-Gima and Ko (2001) state that a highly entrepreneurially orientated firm may be blinded by the belief that it is technologically superior and may aggressively pursue EO in the expectation that it would lead to higher returns. This belief in technological superiority is a myopic short-sighted belief, according to prospect theory (Swift, 2016; Wales et al., 2013c). This thesis has shown that by examining the effect of different values of EO on a firm's performance, at higher values of EO, EO had a significant negative effect on firm performance (short-term and long-term measures). Furthermore, it was shown that as EO increased, its negative effect on a firm's performance became stronger.

In summary, the results of the effect of EO on firm performance among the samples of surviving and failed firms align more with the EO-as-Experimentation perspective. Interestingly, Study 1 results reveal a predominantly negative inverse U-shaped effect of EO on firm performance among the surviving firms. This finding differs from Wiklund and Shepherd (2011) study in that EO was not shown to have a positive effect on a firm's relative performance among surviving firms. Thus, high levels of EO do not necessarily lead to better performance results (e.g. Karmann et al., 2016). This research has shown that EO does not have a relatively beneficial effect on a firm's performance, even among surviving firms.

The next section will outline the effect of the EO dimensions on firm performance in the sample of surviving and failed firms.

10.3.2 Longitudinal Effect of EO Dimensions on Firm Performance

As previously outlined, the literature has tended to treat the different dimensions of EO as an aggregate index, which masks the possibility of revealing the independent effects from each of the EO dimensions (e.g. Eshima & Anderson, 2017). This section will consider the separate outcomes from each of the EO dimensions on firm performance.

By examining the effects of each of the EO dimensions on firm performance (long-term measure of performance), it was shown that the EO dimensions had differential effects. Innovativeness, in comparison to proactiveness and risk taking, was shown to have a positive effect on long-term performance whereas both proactiveness and risk taking had a significant negative effect on the long-term performance in both samples of surviving and failed firms.

In the literature, it has been shown that innovativeness enhances a firm's performance. It has been argued that innovativeness, through its technological leadership, leads to product differentiation and creates a sustainable competitive advantage (Hughes & Morgan, 2007). The findings in this thesis revealed that innovativeness improved a firm's long-term market value since it generates new knowledge assets and develops new competencies. However, according to organisational learning theory, since innovativeness is an explorative trial and error behaviour (Patel et al., 2015), it was also shown in Study 2 that it led to enhanced firm failure over time.

Most of the literature considers that proactiveness enhances a firm's performance since it seizes opportunities in future markets and anticipates changes in market demand (Dess & Lumpkin, 2005). However, by drawing predictions from organisational learning theory, our research found that proactiveness had a negative effect on a firm's performance since proactiveness represents a long-term gamble on forecasting future market trends (Patel et al., 2015).

Risk taking was shown to have a concave effect on the short-term performance and to lead to a decrease in the long-term performance. The results of the risk taking dimension, according to the risk-return paradox, revealed that risk taking had an inverse U-shaped effect in the short-term (Kreiser et al., 2013). However, the concave effect of risk taking on short-term performance was predominantly negative. According to organisational learning theory, risk taking behaviour entails high costs in the long-run due to the requirement of firms to take bold and uncertain moves in committing a large amount of their resources to risky ventures without knowing the success of such outcomes (Dess & Lumpkin, 2005). Using insights from organisational learning theory, we found that risk taking had a negative effect on a firm's long-term performance.

The next section will outline the discussion of the results of Study 2, which examines the effect of EO and its dimensions on the risk of firm failure.

10.4 Study 2: Effect of EO and its Dimensions on Firm Failure

This section discusses the results from Study 2, which examines the effect of EO and its dimensions on firm failure. The classification of firm failure will first be discussed. Then, the effect of EO on firm failure will be outlined followed by a discussion of the results of the effects of the EO dimensions on firm failure.

10.4.1 Firm Failure Classification

By deconstructing the outcome of firm failure and separating firm failure from performance, similar to the deconstruction of the EO dimensions, new revelations were made in this thesis on the effect of EO and each of the EO dimensions in the separate samples of failed firms. It has been argued in the literature that there are complexities in examined relationships that go unnoticed if firm performance and firm failure are considered to be analogous (Josefy et al., 2017). For instance, the Wiklund and Shepherd (2011) study argued that EO would increase the risk of failure, but that it would be positively related to firm performance in the sample of surviving firms. In fact, we showed that one of the EO dimensions, innovativeness, increased the risk of failure (privatisation) over time, even though it enhanced long-term performance of firms. Instead of examining the universal blanket effect of EO on an aggregate firm-level outcome, this thesis brought new insights by examining the separate EO dimension's effects on firm performance as well as on risk of failure in the separate samples of failed firms.

Even though most authors tend to censor or remove acquisitions from their analysis without a theoretical justification (e.g. Revilla, 2016; Swift, 2016), this thesis considers that firm failure entails either a discontinuation of ownership, bankruptcy or insolvency, or privatisation (no longer filing with the SEC). Bankruptcy may be a clear indicator of failure, yet M&A and privatisation also entail failure. Thus, this thesis has justified the consideration into including M&A and privatisation as a risk of failure, in which there are cases of firms that would have filed for bankruptcy if it wasn't for their acquisition. The Altman (1968) Z-score was used to empirically separate successful exits from failed firms (Josefy et al., 2017; Wiklund & Shepherd, 2011).

The next section will discuss the effect of EO on firm failure followed by a discussion of the effect of each of the EO dimension on firm failure.

10.4.2 Effect of EO on Firm Failure

By drawing predictions from organisational learning theory, this thesis found that firms in the high-technology industry have a higher mean value of entrepreneurial orientation. We also found that the high-technology industry had a lower survival rate in comparison to other industries. This higher mean value of EO is because such firms are faced with high-intense competition and changes in the industry, which cause their competencies to become obsolete (Levinthal & March, 1993; March, 1991). Such firms are forced to seek more entrepreneurially oriented strategies and to constantly engage in experimentation to be able to keep up with the constant changes in the industry (Uotila et al., 2009). Organisational learning theory predicts that with increasing risky explorative strategies at the expense of reliable exploitative strategies, firms would face higher risk of failure (March, 1991). Consistent with the insights from organisational learning theory, our results showed a positive association between higher EO values (in the high-tech industry) and lower survival probability (of the high-tech industry). As such, achieving a balance between EO explorative strategies and conservative exploitative strategies is most important in R&D intensive high-technology industries (Uotila et al., 2009).

We showed that failed firms on average were being more entrepreneurial in comparison to surviving firms. This research aligns with prospect theory prediction, which considers that failed firms, with a relatively lower performance compared to surviving firms, are likely to be more entrepreneurially oriented (Swift, 2016). Most importantly, the association of EO with lower performing firms could entail that EO is a predictor of a higher likelihood of firm failure.

The time-series variations of EO over this research's period from the pre-crisis (fiscal year 2000) until the post-crisis period (fiscal year 2014) revealed that EO was increasing during the eve of the financial crisis (fiscal year 2008) in both samples of surviving and failed firms. Furthermore, the failed firms had a higher mean value of EO during the fiscal year 2008 in comparison to surviving firms. This is an interesting revelation, which brings into question the EO-as-Advantage perspective. The financial crisis is a significant economic downturn, characterised by an increase in the financial innovation (in the form of financial instruments) and deregulation, which resulted in increasing the risks (Knights & McCabe, 2015). The time-series graph of EO showed that EO was increasing during the financial crisis, which could be a response to or the leading factor to the crisis (Slevin & Terjesen, 2011).

Considering the above findings, we tested for the causal effect of EO on firm failure using survival analysis. The EO-as-Experimentation perspective predicts that EO has a positive effect on firm failure, as EO is associated with explorative and risky behaviours and increases the variability in outcomes ranging from home-runs to total losses (Wales, 2016). We found that failed firms exhibited higher EO values and more variability through higher standard deviations (shown in table S.1). By utilising survival analysis, it was revealed that the results aligned with the EO-as-Experimentation perspective and that EO led to a higher probability of failure, yet that probability was not proportional with time. That is, the highly entrepreneurially oriented firms in comparison to their industry peers were increasingly deviating from the sample and had a higher risk of failure as time increased. The risk of EO on firm failure increased in the overall sample by a multiple of 2.89, confirming our prediction that EO has a positive relationship with the risk of failure. This provides new research stream to consider the possible outcomes of EO on firm failure. The results do not imply that firms should emphasise conservative strategies at the expense of exploratory strategies, instead they highlight the risks associated with being increasingly entrepreneurially oriented.

Most of the literature on firm survival tends to treat survival/failure as a binary outcome (Josefy et al., 2017), even though firm failure can be either a result of discontinuation of ownership, insolvency, or IPO exit. By examining the effect of EO on risk of failure in the different samples of firms, we showed that EO increased the risk of failure in all the different samples of failed firms (M&A, bankruptcy, and privatisation). Thus, it is not only insightful to examine the overall effect of EO on the risk of firm failure, but it is also important to examine the risk of EO on failure in the different samples of failed firms (Josefy et al., 2017). Interestingly, EO did not only increase the risk of failure from M&A or privatisation, but it also increased the risk of bankruptcy.

The next section will discuss the results of the effect of each of the EO dimensions on the risk of firm failure.

10.4.3 Effect of EO Dimensions on Firm Failure

Initially, this thesis argued that, according to the multi-dimensional conceptualisation of EO, each of the EO dimensions (innovativeness, proactiveness, risk taking) exhibit differential effects on firm failure similar to their effects on firm performance. However, we showed that all three EO dimensions increased firm failure.

Innovativeness (R&D-based proxy for firm-level innovation) has been argued to enhance a firm's survival (Cefis & Marsili, 2005; Lee, 2003) particularly in the high-technology industry (Zahra, 1996) since it provides firms with first-mover advantages and positions them ahead of imitator firms (Lee, 2003). In Study 1, we showed that innovativeness had a positive effect on long-term firm performance. This is consistent with previous research that has shown that innovativeness has a positive impact on a firm's performance (e.g. Hughes & Morgan, 2007). However, some studies have found that innovativeness (R&D intensity) has an insignificant effect on long-term performance (Lin et al., 2006).

Contrastingly, in Study 2, we showed that innovativeness had a positive effect on a firm's failure and increased the risk of failure by 13% despite its positive impact on the long-term firm performance. Firms that were highly innovative in the sample had a significantly lower survival probability. Among the separate samples of failed firms, innovativeness increased the risk of firm failure in the form of privatisation, yet it did not increase the risk of bankruptcy. This finding is interesting as EO overall increased the risk of bankruptcy, but its innovativeness dimension did not.

Possible reasons for the discrepancy between the effect of innovativeness on firm performance versus firm failure may be due to the possibility that innovativeness is ‘more uncertain than playing a lottery as it is a game of chance’ (Coad & Roa, 2008, p. 646). Since innovativeness represents a trial and error behaviour (Patel et al., 2015), our findings suggest that the downside of innovativeness is not the upfront costs of investment, but the negative effect on the viability of the business over time.

This thesis has also argued, according to organisational learning theory, that proactiveness has a positive effect on firm failure as proactiveness entails firms to take long-term gambles on their resources to be invested and orchestrated in forecasted and latent market needs (Patel et al., 2015). The high-technology industry is an aggressive rivalry industry and requires from firms to invest in the current market and take advantage of the market opportunities. By being overly proactive, firms would be risking their current market positioning to act upon unknown predicted information in futuristic markets and conversely sacrifice developing their current competencies (Atuanhene-Gima et al., 2005). As was shown through survival analysis, proactiveness indeed had a positive effect on firm failure in the overall sample of failed firms; highly proactive firms had a lower survival probability. This corroborates the results from Study 1, which revealed that proactiveness had a significant negative effect on long-term firm performance.

The findings in this thesis revealed that risk taking has a positive effect on the risk of firm failure whereby highly risk taking firms had a lower survival probability. According to organisational learning theory, risk taking involves behaviours that increase the variance in firm performance returns and result in uncertain outcomes (Patel et al., 2015; Wiklund & Shepherd, 2011) which could lead to higher likelihood of failure (Alvarez, 2007; Kreiser et al., 2013). In addition, risk taking is linked with increased corrupt behaviours (Karmann et al., 2016) as well as decreased performance (Hughes & Morgan, 2007; Lomberg et al., 2017).

Our findings showed that not all the EO dimensions increased the risk of failure uniformly across the different samples of failed firms. Innovativeness and proactiveness were shown to increase the risk of failure from M&A and privatisation, whereas risk taking was shown to increase the risk of failure among all the samples of failed firms (M&A, privatisation, and bankruptcy). EO increased the risk of failure in the form of bankruptcy due to its risk taking dimension only and increased the risk of failure, in the form of M&A and privatisation, due to the increased risk of failure from its three dimensions.

The next section will discuss the results of the varied mean values of the EO dimensions in the sample of surviving and failed firms and their variation across time in the time-series graphs.

10.5 EO Dimensions' Mean Values and Time-series Effects

Interestingly, even though EO on average was higher among the high-technology firms and in the sample of failed firms, the EO dimensions were not uniformly higher as well. Similarly, even though EO was highest during the financial crisis, the EO dimensions were not unvaryingly at their highest peak during the financial crisis.

On average innovativeness and risk taking dimensions of EO were higher among the high-technology industry and in the sample of failed firms, however proactiveness was lower. This indicates that a firm can be more entrepreneurially oriented and exhibit higher values of one or more of the dimensions, but not necessarily all the EO dimensions (Lumpkin & Dess, 1996). This aligns with the conceptualisation set forth by Lumpkin and Dess (1996) that EO is not considered to be the sum of the EO dimensions as first outlined by Miller (1983). Thereby, such results indicate that it is important to adopt the multi-dimensional conceptualisation and examine the separate effects of the EO dimensions instead of bundling the different dimensions into an index.

By examining the separate mean values of the EO dimensions among the surviving and failed samples of firms and in the high-technology industry versus the excluded sample, it was shown that proactiveness was lower among the failed sample of firms and firms in the high-technology industry. A possible reason that failed firms were being less proactive (proxied through retained earnings) is that, when faced with the competitive pressures of the high-technology industry and their relative lower performance when compared to surviving firms, they would leverage their internal resources more aggressively to make the leap towards a higher-performance level and to be able to compete with higher-performing firms in a highly-intense competitive industry (Davidsson et al., 2009). As such, failed firms would have a higher cost of financing their growth internally in comparison to surviving firms (Davidsson et al., 2009). Furthermore, the negative value of proactiveness among the sample of failed firms could be due to the possibility (or fact) that they were retaining losses instead of profits. Similarly, Altman (1968) predicted that failed firms would have lower retained earnings.

It was revealed in this thesis that innovativeness and risk taking dimensions of EO were increasing during the financial crisis period (fiscal year 2008) in the samples of surviving and failed firms. Innovativeness and risk taking were relatively at their highest peak during the financial crisis. However, proactiveness was decreasing until it reached its minimum point (a mean value less than zero) during the financial crisis. Even though EO on average was highest during the financial crisis, the EO dimensions were not similarly increasing during the financial crisis as well. Among the surviving firms, proactiveness was decreasing from the pre-crisis (fiscal year 2007) until it reached its lowest point in fiscal year 2009. Similarly, among the sample of failed firms, proactiveness was decreasing until it reached its lowest point during the financial crisis. Firms during the financial crisis were performing poorly (relatively lowest points of Tobin's Q and ROA during fiscal year 2008) and possibly were at a disadvantage (cost-of-capital disadvantage) from facing a higher financial cost of internal capital (from retained earnings) to finance their growth in comparison to highly performing firms (Davidsson et al., 2009). This could explain the observed decrease in proactiveness during the financial crisis.

Through the results of Study 1 and the time-series graphs, we showed that there is no covariation between innovativeness and proactiveness. Similarly, Lomberg et al. (2017) found that proactiveness uniquely explained most of the variation in a firm's performance. This entails that proactiveness single-handedly affected a firm's performance, especially when it was not aligned with innovativeness or risk taking. Yet, Anderson et al. (2015) considered that innovativeness is not independent from proactiveness. Our results reveal that proactiveness could be independent from the EO dimensions, innovativeness and risk taking, and challenges the overarching position on EO of a positive covariance among the EO dimensions (Wales et al., 2013c). This provides a potential conceptual contribution to EO.

The next section will discuss the theoretical contributions of this thesis.

10.6 Summary of Theoretical Contributions

This thesis has contributed to the existing literature by using objective measures and including failed firms in its analysis.

In seeking to address the aforementioned theoretical gaps (in section 10.2) and advance knowledge on EO, this research examined the longitudinal effect of EO and each of its dimensions on firm performance (short-term and long-term measures) and on risk of failure. To guide this research, this thesis has used insights from the theoretical framework of organisational learning and prospect theory (Bernartzi & Thaler, 1995; March, 1991, 2006). Based on our theoretical framework, we had three main hypotheses in relation to EO: 1) EO has an inverse U-shaped effect on performance among surviving firms that is lower levels of EO lead to a positive impact on performance, but as EO increases its positive impact decreases among surviving firms, 2) EO has a negative effect on a firm's performance among failed firms, and 3) EO has a positive relationship with the risk of failure.

In support of our hypotheses we found that indeed EO had an inverse U-shaped relationship with performance among the sample of surviving firms. By testing for different values of EO in the sample of surviving firms, we showed that at lower values of EO, EO had a positive effect on firm performance. As EO increased, it had a significant negative impact on firm performance. Among the sample of failed firms, EO had a negative effect on performance. Based on the EO-as-Experimentation perspective, our results reveal that there are risks associated with entrepreneurial behaviours, which would jeopardise the firm's standing in the long-run (Burgelman, 1991; Hambrick & De'Aveni, 1988; Levinthal & March, 1993). Our findings indicate that past research did not capture the double-edged nature of EO. This is because most of the past research examined the effect of EO along a cross-section and only amongst surviving firms. When examined over time in a sample of surviving as well as failed firms, evidently EO was shown to be more in line with the EO-as-Experimentation perspective (Wiklund & Shepherd, 2011).

The most important contribution is its theoretical contribution of the outcomes from EO and its dimensions. The theoretical contribution of this thesis is threefold: 1) organisational learning theory and prospect theory can predict whether EO and each of its dimensions have adverse effects on firm performance and survival 2) addressing the survivor bias in EO literature reveals that by including a sample of failed firms, EO is a cause of failure rather than a response to a failing situation, 3) the different effects of the sub-dimensions of EO reveal the independence of the dimensions and the importance of examining the separate effects of the dimensions rather than the overall EO construct. The below paragraphs will therein discuss the theoretical contributions.

10.6.1 Organisational Learning Theory and Prospect Theory

Most of the literature considers EO to be a driver for firm success and a strategic behaviour for building an inimitable competitive advantage based on the resource-based view (RBV) (Rauch et al., 2009), which has birthed the EO-as-Advantage perspective. The EO-as-Advantage perspective, the dominating view of EO in the literature, most certainly disregards the risks associated with EO and the fact that engaging in entrepreneurial behaviours involves risk taking behaviours (Wiklund & Shepherd, 2011).

Even though one of the main arguments of RBV on the sustainable competitive advantage of EO requires a longitudinal analysis, this is unarguably absent from the EO research (Barney et al., 2001). Recent research has shown that EO's positive effect decreased over time even though initially EO had a strong positive impact on a firm's performance (Gupta & Gupta, 2015). This does not align with the EO-as-Advantage perspective.

Theoretically speaking, EO is an explorative endeavour that leads to uncertain outcomes and is risk-seeking and variation-increasing (Burgelman, 1991; March, 1991). According to organisational learning and prospect theory, our findings indicate that surviving firms were spending less on EO and thus were more exploitative and risk-averse in comparison to failed firms that were more entrepreneurially oriented (Kahneman & Tversky, 1979; March, 1991). Most importantly, we revealed that below-average performing firms that were highly explorative and entrepreneurial were more likely to fail (Levinthal & March, 1993). Thereby, this thesis reveals that by using organisational learning theory and prospect theory, EO does not lead to a sustained competitive advantage. On the other hand, by adopting an exploratory risky strategy, EO might have a positive effect on the risk of failure.

Organisational learning theory and prospect theory are interlinked in that they predict organisational change and search exploratory strategies based on the firm's performance relative to a reference value (Argote & Greve, 2007). Organisational learning model developed by Lant and Mezias (1990) was influenced by prospect theory (Kahneman & Tversky, 1979). That is, firms engage in exploratory learning to reduce the perceived gap between the current performance level and the desired wealth state (Lant et al., 1992). When firms engage in proactive forward looking long-term gambling behaviours and extreme re-orientation problematic search strategies to initiate organisational change in the prospect of achieving higher profitability, they inherently subject themselves to a higher degree of uncertainty and increase the possibility of failing (Crant, 2000; Dodgson, 1993; Eisenhardt 1989). Thus, according to prospect theory and organisational learning theory, we propose that the risks inherent within EO are attached to the proactiveness forward looking dimension and the risk taking dimension.

This thesis posited that organisational entrepreneurial learning behaviours are not entirely risk-producing strategies as innovative learning strategies might produce long-term benefits in that they enhance the existing competencies by building new knowledge flows, initiating new discoveries, and leading to internal development, which allows firms to remain viable and dynamic in uncertain changing environments (Fiol & Lyles, 1985). According to insights from organisational learning theory, the benefits of entrepreneurial behaviours on long-term performance are contained within the innovativeness dimension (Zahra et al., 1999). This is important as it was shown that in contrast to the proactiveness and risk taking dimension, innovativeness was the only type of explorative learning that enhanced long-term performance over time. In this sense, since the innovativeness dimension operates differently (by building new knowledge bases) in comparison to the proactiveness and the risk taking dimension, the benefits of innovative learning outweigh its costs on firm performance in the long-run. Yet, interestingly, as innovative learning requires extensive resources (Schumpter, 1942), our results on its effect on the overall risk of failure reveal that as it is an exploratory learning mechanism, firms that increase their innovative learning at the expense of exploitative learning enhance their risk of failure over time (March, 1991). That is, even though innovativeness is required for strategic renewal, 'too much of change' would increase the risk of failure by causing the firm to lose the sense of its direction (Fiol & Lyles, 1985). Perhaps then, the costs of the innovative learning dimension are not only immediate but might entail long-term costs when it is sustained and increased over time. Thus, over time solely explorative learning mechanisms, whether they are innovative, proactive, or risk taking in nature would enhance the risk of failure across a significant timeframe (Levitt & March, 1988; March, 1991).

Before the proposition of Bowman's risk-return paradox, most economic theories considered that the risk-performance relationship was positive (Bowman, 1980). By using insights from prospect theory, Fiegenbaum and Thomas (1988) revealed that the risk and return relationship is negative among below-average performers. Thus, based on prospect theory, it has been empirically shown in the literature that as firms increase their levels of risk taking, the probability of negative outcomes increases (Chou et al., 2009; Singh, 1986). As the risk-return paradox was inspired by prospect theory, this thesis uses prospect theory to predict different outcomes from exploratory learning behaviours among surviving above-average performing firms and failed firms. By using prospect theory in conjunction with organisational learning theory, this thesis reveals that entrepreneurial orientation is a double-edged sword or a paradoxical concept (Argote & Greve, 2007), a phenomenon similar to the risk-return paradox (Fiegenbaum, 1990). The paradoxical nature of EO refers to the relationship of EO with performance among the sample of surviving firms versus failed firms, in which the results showed that EO had an inverse-U shaped relationship with performance among surviving firms, yet a negative relationship with performance among failed firms. Thus, prospect theory (Kahneman & Tversky, 1979) and organisational learning theory (Levinthal & March, 1993) revealed that being more entrepreneurially oriented does not pay off for firms facing distress (Dodgson, 1993).

Due to the limitations in the literature of a cross-sectional bias and a survivor bias, this thesis sought to address these limitations by including a representative sample of surviving and failed firms and using insights from organisational learning theory and prospect theory. EO and its dimensions may be explained by learning-related independent organisational processes that operate to either produce new knowledge flows, anticipate future demand, and to make timely decisions and large commitments to resources before assessing alternatives to reduce the discrepancy between the current state and a desired reference value (Bowman, 1980; Crant, 2000; Garud & Nayyar, 1994). The myopia of explorative learning as well as its sub-dimensions was revealed when assessed against long-term outcomes over a significant period of time. When organisational learning is applied with prospect theory, it reveals the paradox of EO. This is integral to set in motion a new stream of research that addresses the double-edged sword nature of EO.

The next section will outline the second theoretical contribution of this study, which is the inclusion of the sample of failed firms to assess differential outcomes of entrepreneurial exploratory learning behaviours among failed firms versus surviving firms.

10.6.2 Survivor Bias and Inclusion of Failed Firms

The literature has been limited by a survivor bias, in which most researchers conclude that EO is advantageous to a firm' performance whilst only examining its outcomes in a sample of surviving firms (e.g. Rauch et al., 2009; Shahzad et al., 2016). Wiklund and Shepherd (2011) theorised that EO would increase the risk of failure, based on predictions from organisational learning theory (Wiklund & Shepherd, 2011). Yet, few EO researchers have followed upon the predictions of Wiklund and Shepherd (2011) and utilised the theoretical framework of organisational learning theory (Wales, 2016). From a theoretical perspective, the decision heuristics and biases involved in organisational behaviours may be difficult to assess and understand without considering the various properties of different organisational learning processes (Denrell, 2003).

Interlinked with organisational learning theory, prospect theory is integral in addressing the problem of under-samples of failed firms (Denrell, 2003). Based on prospect theory, firms can be classified based on their relative performance (Fiegenbaum & Thomas, 1988). Firms that are below-average performers are likely to exhibit a different degree of exploratory and risky behaviours in comparison to firms that are high-performers. Thus, it is important to address the overwhelming and plaguing survivor bias to reveal the different outcomes from entrepreneurial behaviours in the sample of failed firms in comparison to the sample of surviving firms. The literature has continuously shown that EO has a direct positive effect on firm performance whilst only examining its effect among surviving firms. Yet, if researchers use theoretical predictions from organisational learning theory and prospect theory, it can be revealed that EO might exhibit a variance-seeking and producing nature with its adverse impact on below-average performing firms (Argote & Greve, 2007; Dodgson, 1993). Organisational learning theory predicts that highly explorative behaviours lead to a higher risk of failure over time, which has been empirically shown (e.g. Swift, 2016). This aligns with the alternative EO-as-Experimentation perspective, which was originally conceptualised and defined by Wiklund and Shepherd (2011) based on insights from organisational learning theory.

The under-sampling of failed firms, due to theoretical gaps in the EO literature, leads to the systematic biased beliefs that certain strategies that may hurt performance of firms are perceived to be beneficial and superior to other strategies (Bromiley, 1991; Lant et al., 1992). Researchers that examine entrepreneurial orientation (a construct that includes proactive gambling strategies and risk-seeking behaviours) learning processes among above-average performers would be ‘dis-proportionally represented’ and would reveal that entrepreneurial learning behaviours are performance-enhancing rather than variability-producing (Denrell, 2003). Such research designs that exclude failed firms is not uncommon in the management literature and more specifically in EO research; thus, this brings into question the possibility that once-considered valued firm-level behaviours may not be consistently ideal throughout time. This means that researchers have only been considering one of the edges of the sword and this produces misleading view of the EO-firm performance relationship (Wiklund & Shepherd, 2011). This balanced inquiry of the two edges of the sword reveals that the anti-failure bias in the literature that excludes organisational learning theory and prospect theory leads to the overestimation of performance and underestimation of the risks associated with exploratory learning processes when sustained over time. The anti-failure bias has led to masking the adverse effects of exploratory learning processes (Denrell, 2003) even though it is well known based on theory that they are prone to biases and spurious errors of estimation (Huber, 1991; Levinthal & March, 1993). By including a sample of failed firms, we were able to show that EO led to an increased risk of failure rather than being the response to a failing situation.

The next section will outline the theoretical contribution of revealing the multi-dimensional nature of the EO construct on organisational outcomes.

10.6.3 Multi-Dimensional Conceptualisation of EO

This research has argued that each of the EO dimensions has a varying effect on firm-level outcomes. The findings of this thesis provide empirical evidence, that is consistent with the multi-dimensional conceptualisation of EO (Lumpkin & Dess, 1996). Each of the EO dimensions had opposing effects on the long-term performance. Supporting the hypotheses, it was shown that innovativeness improved the long-term performance, yet proactiveness and risk taking decreased the long-term performance. Most of the literature that examines the EO and firm performance relationship and even recent literature adopts the gestalt conceptualisation of EO and only examines the overall effect of EO (Eshima & Anderson, 2017; Mthanti & Ojah, 2017). Yet, several researchers have shown that the EO dimensions have differential effects (Hughes & Morgan, 2007; Karmann et al., 2016).

Based on organisational learning theory, this thesis theorised that the learning process and its corresponding outcomes differs among the separate types of generative or explorative learning (Zahra et al., 1999). Morgan and Berthon (2008) defined generative learning as generating new distinctive ideas along with their distribution and interpretation, taking responsive action, and engaging in risk taking actions. The innovativeness dimension is the constitute of organisational learning behaviours that leads to developing new valuable knowledge and core competencies (Hamel & Prahalad, 1994) and is beneficial on the firm's long-term performance (Grant, 1996). The learning and knowledge that are therein generated are integral for the strategic renewal of the firm and its development. Whereas the other dimensions of the explorative experimental learning behaviours, proactiveness and risk taking, operate through reducing a gap between the current state and a desired futuristic state based on organisational learning theory and prospect theory (Bowman, 1980; Crant, 2000). There are higher uncertainties attached to the proactiveness and risk taking dimensions as they operate based upon unknown aspired or predicted targets that the firm sets as a reference (Lant & Mezias, 1990). We hypothesised that even though generally explorative generative learning involves higher risks and a possibility of negative firm-level outcomes, the generative learning processes are more complex rather than a one-dimensional construct termed 'EO'. Overall the EO construct leads to a negative effect on long-term firm performance over time, yet this undermines the complex nature of its different dimensions or learning processes. By examining the overall effect of EO, the effect of EO on firm performance reveals a negative concave decreasing relationship. The proactiveness and the risk taking dimensions mask the positive impact of the innovativeness dimension. If the multi-dimensional conceptualisation was not adopted, then one would not be able to reveal the enhancing effect of the innovative learning dimension on long-term performance.

Yet, innovativeness dimension of EO involves the search for developing new radical innovative products and implementing R&D processes that differ in a dramatic way from previous products and methods of operation. This sets the possibility for extreme losses over time (Hurely & Hult, 1998; Taylor & Greve, 2006). Explorative innovative learning entails risks, in which uncertainty exists as to whether breakthrough innovations would be later adopted by consumers and transform into marketable products (Baker & Sinkula, 2005). Furthermore, even though innovativeness does have benefits on the long-term performance, an exclusive focus on explorative innovation would negatively impact the standing of the firm as a balance must be achieved between explorative and exploitative behaviours (March, 1991; Morgan & Berthon, 2008). Recent research has revealed that high levels of

R&D intensity may be subject to diminishing returns (Koryak et al., 2018) and even enhance failure over time (Swift, 2016). This reveals the importance of considering the impact of explorative positively-viewed learning behaviours on the most important organisational outcome, the firm's viability.

In summary, this thesis indicates that there is a need to consider the longitudinal effect of EO and each of its dimensions among a representative sample of surviving and failed firms. It also urges researchers to adopt objective measures of EO to be able to examine its effects along a significant timeframe (e.g. Gupta et al., 2016). Furthermore, this research shows that a consideration for several performance outcomes is vital to reveal the different effects of each of the EO dimensions on several firm-level outcomes (short-term performance, long-term performance, and firm failure).

This research contributes to the theoretical development of EO by revealing that the EO-performance relationship is more consistent with the EO-as-Experimentation perspective, which originates from organisational learning theory (Wiklund & Shepherd, 2011) and is consistent with predictions from prospect theory (Kahneman & Tversky, 1979). This should encourage more theorising in the EO research to move away from the focus on the resource-based view (Wales, 2016) to more theoretical frameworks that consider the risks associated with EO.

10.7 Chapter Conclusion

To provide a deeper understanding of the risks associated with EO and its dimensions, this thesis examined the effects of EO and each of its dimensions on firm-level outcomes (performance and failure). The novelty of this research lies in separating the samples of surviving and failed firms to test the EO-as-Experimentation perspective. Our findings surfaced the major problems in the literature, of which most importantly are the issues of cross-sectional design and survivor bias. The results of this thesis aligned with the EO-as-Experimentation perspective (Wiklund & Shepherd, 2011), which originates from organisational learning theory. When examining the separate effects of the EO dimensions, it was shown that even though innovativeness improved the long-term performance, it led to a higher rate of failure over time. Whereas proactiveness and risk taking were shown to lead to a negative long-term performance as well as higher probability of failure. This indicates that EO, and unequivocally its dimensions, lead to a higher risk of failure over time. Our findings have clear implications for theoretical development and more consideration beyond the resource-based theory when examining the EO and firm performance relationship.

Chapter 11

Introduction, Contributions, Managerial Implications, Limitations, and Future Research, and conclusions

11.1 Introduction to the Chapter

This research aimed to address the effects of EO and each of its dimensions on different organisational performance outcomes as well as on risk of firm failure by drawing theoretical predictions from organisational learning theory and prospect theory.

The motivation behind this thesis stemmed from major limitations underlying our understanding of the longitudinal impact of an entrepreneurial orientation on a firm's viability in the long-run. Specifically, most of the literature examines the cross-sectional effect of EO on a short-term measure of firm performance, and concludes that EO is advantageous on a firm's performance and is critical for firms to ensure a sustainable substantial competitive advantage (Gupta & Gupta., 2015). A recent review by Gupta and Dutta (2016) revealed the few number of articles that have critiqued EO in the literature (Andersén, 2010; Covin & Wales, 2012; Miller, 2011). Thus, there is a major setback in advancing our understanding on EO if most of the research to this date continues to repeat the same limitations of past research to arrive to the desirable conclusion that EO universally is positive on a firm's performance. This thesis aimed to challenge this hegemony in alignment with the EO-as-Advantage view of EO through the theoretical foundation of organisational learning theory and prospect theory. As such, this thesis predicted that EO's double edged nature would be revealed when assessed over a significant period.

To date our understanding of the causal mechanism of the effect of EO on important organisational outcomes is limited, which has led to knowledge on EO to be underdeveloped and mis-specified. Most of the literature on EO currently is significantly limited to resource-based theory (Rauch et al., 2009; Wales, 2016). Of great potential and significance is organisational learning theory, which hypothesises that EO may lead to a risk of failure as an increased focus on exploratory behaviours carries with it great risk and potential for failure (March, 1991). Furthermore, prospect theory, based on myopic loss aversion, considers that firms that are at a risk of failure or in a financial distress situation are more likely to engage in higher levels of risky entrepreneurial behaviours (Swift, 2016). In comparison to resource-based theory, such theories capture this potential downside of EO.

This thesis addressed its research aim by (1) testing the effect of EO and each of its dimensions on various measures of firm performance (ROA and Tobin's Q) in the separate samples of surviving firms and failed firms, and (2) testing the effect of EO and its independent dimensions, innovativeness, proactiveness, and risk taking, on the risk of firm failure. To test the causal effect of EO and its dimensions on firm-level outcomes, panel fixed effect regression was used to examine the effect of EO and its dimensions on firm performance measures in the samples of surviving and failed firms (Study 1) and survival analysis was employed to examine the effect of EO and its dimensions on the risk of firm failure (Study 2). By using organisational learning and prospect theory as the theoretical backbone to this thesis, 8 hypotheses were developed.

The findings of this thesis showed that the hypotheses that are tailored to the effect of EO on firm performance and risk of failure (*H*1, *H*2a and *H*2b, *H*3a and *H*3b, , *H*4, and H5) were supported. Specifically, it was shown that EO had an inverse-U shaped relationship with short-term and long-term firm performance among surviving firms, thus supporting *H*2a and *H*2b.. Furthermore, it was shown that EO had a significant negative effect on short-term and long-term firm performance among failed firms supporting *H*3a and *H*3b. The results also revealed that EO significantly increased the risk of firm failure supporting *H*4. In support of *H*1, failed firms were more entrepreneurially oriented. Firms in the high-technology industry were more entrepreneurially oriented and had a significantly lower survival probability, thus supporting *H*5. With respect to the EO dimensions, this thesis showed that six of the eight hypotheses (*H*6b, *H*7b, *H*7c, *H*8a, *H*8b, *H*8c) tailored to the effect of each of the EO dimensions on firm performance as well as on risk of failure were supported. That is, innovativeness had a significant positive effect on long-term performance (supporting hypothesis *H*6b), proactiveness had a significant negative effect on long-term performance (supporting *H*7b), and risk taking had a significant negative concave effect on short-term performance (in support of *H*8a) and a significant negative effect on long-term performance (supporting *H*8b). Two of the hypotheses, *H*6a and *H*7a, were not supported due to presence of endogeneity. This reveals that Tobin's Q is more of a superior measure compared to ROA, since our results of the innovativeness and proactiveness dimension on ROA were biased with endogeneity (Uotila et al., 2009). Lastly, hypothesis *H*6c was not supported and contrary to this hypothesis, it was revealed that innovativeness had a significant positive effect on firm failure. In support of hypotheses *H*7c and *H*8c, proactiveness and risk taking had a significant positive effect on firm failure respectively. The contributions of these results are discussed in the next section.

11.2 Research Contributions

The findings of this thesis have significant theoretical and research implications for EO through the theoretical frameworks of organisational learning theory and prospect theory. This thesis has shown that, regardless of the few early researchers who have critically questioned the superior performance outcome from EO, most previous research has been biased towards presuming a positive EO-firm performance relationship (e.g. Andersén, 2010). The majority of previous research focused on performance effects from EO more so than what was actually being captured when assessing the effect of EO on firm performance (Gupta & Wales, 2017).

The dominating view that EO improves a firm's performance is still surprisingly present as recent research cites the Rauch et al. (2009) meta-analysis study and concludes that 'EO is important for firms to pursue as consistently findings in the research prove that highly entrepreneurially oriented firms grow at a faster rate' (Eshima & Anderson, 2017). This conclusion is premature because such a statement is flawed considering that major limitations in the research continue to be ignored. Such limitations are: 1) EO has been measured using subjective managerial perceptions through the Miller (1983)/Covin and Slevin (1989) EO scale (e.g. Eshima & Anderson, 2017; Patel et al., 2015), 2) the EO gestalt conceptualisation has been the most common conceptualisation disregarding the individualistic effects of EO dimensions (e.g. Gupta & Gupta, 2015), 3) the research examines the cross-sectional effect of EO without taking into consideration the time factor (e.g. Lomberg et al., 2017), 4) the value of EO is tested on aggregated firm performance indices or short-term measures (Gupta & Wales, 2017), and lastly and most importantly, 5) there is a survivor bias, in which firms disregard examining EO among a sample of failed firms (e.g. Eshima & Anderson, 2017, Lomberg et al., 2017; Rauch et al., 2009).

Using the theoretical arguments from organisational learning theory and prospect theory, this research advances our knowledge by examining the longitudinal effect of EO over a 15-year period on several firm performance outcomes. The novelty of the work is in accounting for the effect of EO and its dimensions over time. Furthermore, the inclusion of several performance measures allows the capturing of the multi-dimensional nature of firm performance (short-term and long-term performance and risk of failure). Contrary to previous research, this research controls for heterogeneity and endogeneity of omitted variables, and allows for causal inferences by using panel data modelling instead of the dominating cross-sectional testing in EO research (Gupta & Gupta, 2015).

According to organisational learning and prospect theory, the outcomes of an exploratory entrepreneurial orientation are only revealed in the long-run, and thus the value of EO should be assessed against a long-term measure of performance (Uotila et al., 2009). Thus, this study mainly focused on the long-term measure of performance (Tobin's Q), which assesses the value of EO in the long-run. Tobin's Q was used, since very little attention has been directed towards stock-based measures or market value of EO (Gupta & Wales, 2017). As noted by Gupta and Wales (2017), assessing the value of EO on stock-based measures of performance would allow researchers to bridge this important organisational behaviour (EO) into the finance and economics domains (e.g. Uotila et al., 2009). Furthermore, to move the EO research forward, secondary measures of EO should go in tandem with adoption of stock-based long-term measures of performance (Gupta & Wales, 2017). Tobin's Q is an important organisational performance outcome that would reveal the long-term implications of EO (Gupta & Wales, 2017). Market based measures have been used to examine effects of variables along a long-time horizon (Gupta et al., 2016), thus, validating the use of this measure in our research.

The novelty of this research extends beyond including a long-term measure of performance to measuring the effect of EO on the risk of firm failure. This has not been tested in previous literature. Testing EO against the risk of failure is vital because the nature of its experimentation and uncertainty are brushed over in most research (Wiklund & Shepherd, 2011). Moreover, it is essential to examine the effect of EO against the risk of failure rather than on long-term performance only. We use organisational learning theory and prospect theory as the backbone of this research to theorise outcomes from EO on the probability of organisational failure. Even though we showed that being innovative was beneficial on the long-term performance, it led to a higher risk of failure over time. Thereby, the risk inherent within EO cannot be realised unless tested on the risk of failure.

Contrary to most research and consistent with the multi-dimensional conceptualisation of EO, this thesis theorised that each of the EO dimensions exhibited a different effect on firm performance. Examining the effect of the EO dimensions on different firm performance indicators is in contrast to most research that prefers to bundle the EO dimensions into the gestalt EO construct and examine its overall effect on a hybrid measure of performance. Indeed, such performance hybrid measures have been increasing (Gupta & Wales, 2017). In this respect, this research is a major contribution as it provided the ability to expose the 'nuanced EO-performance effects' (Gupta & Wales, 2017). Our findings showed that, as hypothesised, the risk taking dimension had a contrasting effect on firm performance in comparison to innovativeness, and its effects were different when assessed on short-term performance versus long-term performance. This implies that the independent effects of the EO dimensions between and among themselves are only revealed when several performance outcomes are taken into consideration.

To allow the longitudinal investigation of EO on several firm performance measures, this research advanced the prior research by utilising objective secondary proxies. Even though subjective measures have been the dominant conceptualisation of EO, some researchers have only recently adopted the secondary measurement approach (e.g. Miller & Le Breton-Miller, 2011; Mthanti & Ojah, 2017; Shahzad et al., 2016). Using objective measures rigorously for examining EO is a 'state-of-the art' approach, as their use is still new and fledgling to date. The objective measurement of EO forgoes the limitation of subjectivity managerial bias and non-response bias of EO scale measurement. Furthermore, the objective measurement of EO would conceptually align with EO as a firm-level behaviour instead of mistakenly considering managerial perceptions as firm-level behaviours.

In addition to the above, this research addressed the major limitation of survivor bias in the literature. Based on organisational learning theory, it separated the outcomes from EO and its dimensions on firm-level outcomes in two sets of samples (surviving firms versus failed firms) (Wiklund & Shepherd, 2011). By doing so, this research theorised the outcomes from EO among surviving firms distinguishably from its outcomes in the sample of failed firms. Research to date is still subject to this major limitation of survivor bias (e.g. Lomberg et al., 2017). What is surprising is that Wiklund and Shepherd (2011) theorised negative outcomes from EO among the sample of failed firms, yet researchers continued to ignore the potential downside of EO. Recent research still cites the infamously Rauch et al. (2009) meta-analysis as evidence that EO is beneficial. This is alarming as the limitations of past research is being repeated among current researchers. If such limitations continue to be ignored, then what is novel about the new stream of research? Not only did this thesis examine the separate impact of EO and its dimensions on several performance measures among the surviving firms versus the failed firms, but it also examined the separate impact of EO and each of its dimensions on the risk of firm failure in the separate samples of failed firms. Recently, a review of firm survival/failure in the literature revealed that most researchers bundle the effects of their tested variables in an overall sample of failed firms without capturing the multi-dimensional aspect of failure (Josefy et al., 2017). Thereby, it is important to examine the effect of EO on the overall risk of failure as well as on a specific form of failure (e.g. M&A, bankruptcy, privatisation).

Lastly, the focus of the effects of EO and its dimensions on firm-level outcomes, within the context of large high-technology firms and the pre-crisis to the post-crisis period, represents a contextual consideration that allowed for deeper and more meaningful insights into EO's double-edged nature. Such a specific context offers more focused theoretical revelations (Gupta & Wales, 2017; Wales, 2016). The significant added value of this thesis is its theoretical contribution.

The next section will present the managerial practical implications of the research findings.

11.3 Managerial Implications

This thesis has practical implications for managers of large US firms in the high-technology industry. It highlights the possible negative outcomes of EO on firm performance over time and thus provides insights on how to better ensure the probability of firm survival in the overly competitive constantly changing high-tech market at times of significant economic crisis. Most of the current industrial hindsight focuses on start-up failures in line with the conventional belief that a majority of start-up businesses are likely to fail. Moreover, the research on revealing the possible double-edged nature of EO has tended to focus on small business performance (e.g. Wales et al., 2013b; Wiklund & Shepherd, 2005) or family businesses (e.g. Revilla et al., 2016). Yet, established large firms can also be subject to failure. The ultimate goal of managers is to ensure the survival of their business over time. This is where the findings of this research are valuable to them as we address whether large established firms might fail as a result of being too entrepreneurial.

A firm that is entrepreneurial is fundamentally innovative, proactive, and risk taking. The question is then: do managers really benefit from being more innovative, proactive, and risk taking in the long-run? The findings of this research on the effect of each dimension of EO on several performance outcomes (short-term, long-term, and survival) provide an interesting outlook for managers since each dimension of EO was shown to have a unique effect on a specific performance outcome. Managers must realize the trade-offs of the separate EO dimensions on the different performance outcomes. According to the results of this research, if the goal of managers is to achieve short-term returns, then they might benefit from being proactive and taking moderate risks. Thus, as most managers tend to be short-term-focused and to be concerned with affecting their immediate current rather than the long-term environment (Levinthal & March, 1993), proactiveness and risk taking might provide such managers with short-term benefits. Whereas, if the goal of the managers is to enhance their long-term stock or market value, then they must attend to being more innovative (by spending more on R&D) and be less proactive and less risk taking. Yet, overall, being entrepreneurial is a resource intensive strategy that drives the firm to engage in behaviours and activities that are far from its competencies and that might subject it to a higher probability of failure. As our findings suggest to managers, being innovative, proactive, and risk taking over time increase the probability of failure for large US high-tech firms. Thus, a high-technology overly competitive industry might subject firms to engage in behaviours that are too entrepreneurial or explorative (rather than exploitative or refining behaviours). It is this constant experimentation and exploration that highly increases the chances of failure over time.

Most of the current research on EO focuses on its outcomes in a sample of surviving firms. There is a huge research gap on examining the possible outcomes of EO in a sample of failed firms. Firms that cease to exist either due to an acquisition or liquidation should be examined in EO research, especially if survival or performance are the dependent variables of concern. Managers might use research findings as guidelines on how to steer their firms. Thereby, research that mostly concludes that EO is advantageous to a firm (and only examines surviving firms) would lead to biased managerial beliefs that there are more financial returns to entrepreneurial investment strategies. Through our research, it was shown that entrepreneurial behaviours do not exhibit a linear effect on a surviving firm's performance. That is, managers should realize that entrepreneurial behaviours might benefit a surviving firm's performance at lower levels of investment. However, as surviving firms increase their focus and alignment of their strategies with only entrepreneurial strategies, such firms would suffer from lower performance returns in the short-run and the long-run. Thus, large surviving firms might benefit from being entrepreneurial since they differentiate themselves from competitors. With increasing levels of being entrepreneurial, firms are likely to engage in more risk-taking and experimental foolishness. The finding of EO's non-linear effect on performance among surviving firms corroborates with the double-edged nature of EO. In contrast, our findings of EO's linear negative effect on performance among failed firms indicate that EO has a negative effect on performance of failed firms (even at lower levels of investment). In contrast to most research, such findings would assist managers to realize that entrepreneurial behaviours are not linearly advantageous when examined over time. That is, EO not only can enhance performance up to a threshold point among surviving firms, but it might also have a negative effect on performance among failed firms and even enhance the probability of their failure over time.

Overall EO decreased the long-term performance over time and enhanced the risk of failure (M&A, bankruptcy, and privatisation) for large firms in the high-technology industry. Highly entrepreneurially oriented firms had lower survival probability. Deconstructing the latent EO construct into its main components provided further understanding for managers that being entrepreneurially oriented is fundamentally involving dimensions of contrasting effects: being innovative had a positive effect on the long-term performance, while being proactive and taking risks had a negative effect on the long-term performance. Interestingly, even though being innovative had a positive effect on the long-term market value of the firm, it increased the risk of failure over time. Furthermore, the EO dimensions, proactiveness and risk taking, were shown to increase the risk of failure. Thereby, practitioners must take into account the negative impact of EO and each of its dimensions on firm survival, especially that EO is continuously and universally considered to be a performance-enhancing orientation for firms (Rauch et al., 2009). When EO is high, there are incurring costs for firms that potentially ignite the halt to their presence in the market. Being overly-focused on pursuing exploratory behaviours at the expense of reliable exploitative activities is likely to result in a higher likelihood of losses than gains (March, 1991; Swift, 2016). The high-technology industry forces firms to pursue higher exploratory endeavours to ensure they do not face a risk of obsolescence.. Our findings suggest that large firms must not be overly explorative, especially in R&D intensive high-technology industries (March, 1991; Uotila et al., 2009). The question then is which learning mechansims are valuable and to what threshold would firms reach the desired performance level (Miner & Mezias, 1996).

Certain examples of firms that had a high entrepreneurial orientation and failed as a result of bankruptcy or liquidation in our sample include: Midway Games Inc., Remec Inc, Sheldahl Inc, and Trident microsystems Inc etc. Midway Games Inc. was an American video game developer that franchised Mortal Komba and was one of the world's leading producers in making video games. It revived the video game industry with the introduction of Mortal Kombat in 1992. Yet, it overly expanded in the mid 1990's and acquired several companies to begin producing its own 'home games'. With the shift in focus of the firm, this added more R&D costs, in which the annual R&D of the firm increased from 1995 to 1996 from a value of 8.4 million to $ 32.5 million. The company retained over 80 % of its shares and they were reinvesting their profits to maintain their increased growth. This is the case especially for growing companies that may prefer to retain their earnings to fuel their business instead of paying dividends. However, eventually with increasingly engaging in-debt financing, borrowing heavily, and taking more risks, the company filed for bankruptcy in 2011. This clear example indicates to managers the risks that are associated with EO over time.

Established giant firms are always in a race to be first-movers and managers are mostly concerned with being the first to market (Tellis & Golder, 1996). There is a managerial bias that riskier investments will lead to more returns and this biased relationship becomes steeper when firms are facing crisis situations. Errors in the learning process held within entrepreneurial behaviours are costly and can even lead to disastrous outcomes for firms. Including a sample of failed firms in the study holds great value for managers as lessons are ought to be learned. Kodak is a classic example of a firm that failed to realise the importance of transitioning from film to digital photography. As a result, the firm filed for bankruptcy by 2012 and its failure resulted in significant losses for its employees and its shareholders. Managers do not realize that, by excessively supporting radical technologies that are of an experimental nature, they are subjecting their firms to a higher failure possibility as well.

The technologies that are expected to materialise into marketable and profitable novel discoveries and to lead to new avenues for growth and development are the same as those that could result in costly errors of estimation. Thus, the first to market is not always synonymous with successful outcomes. A dominant large firm reaches its dominant position by being explorative in nature and by exploiting its existing competencies. Yet by being exceedingly a pioneer might not work in the favour of the firm. By the 1980's Apple computers were referred to as the 'pioneers of personal computers'. Yet, Micro Instrumentation and Telemetry Systems (MITS) was the initial market pioneer. In 1976, MITS was termed the 'IBM of home computers' (Freiberger & Swaine, 1999). The early success and lead of the firm was not long-lasting. Yet, most of the industry does not discuss the failure of such firms and attributes the 'undeserved praise' to other firms, such as Apple Inc. (Tellis & Golder, 1996). Interestingly in the sample of our study, Apple Inc. was one of the firms that was exhibiting levels at the lower-end to moderate in entrepreneurial orientation and its dimensions. For firms to survive, managers should realise that a balance must be achieved between explorative foolishness and exploitation. In light of the findings, managers must acknowledge the uncertainty inherent within entrepreneurial behaviours and the possibility that being a market pioneer does not necessarily lead to long-term success and viability.

The next section will outline the limitations and the possible future research directions.

11.4 Limitations and Future Research

This thesis has focused on the direct effects of EO and its dimensions on firm performance and risk of failure in the form of a longitudinal analysis. Even though the results of this thesis provide new exciting revelations, further future research is warranted. The below section will outline the limitations and possible research avenues to address these limitations.

The first limitation of this thesis is that it only focused on the direct impact of EO and the EO dimensions on organisational outcomes, without considering possible moderators that would affect the strength of the EO-firm performance. Previous research has focused on investigating new potential moderators that influence the established EO-firm performance relationship, yet this has been only their principal unoriginal contribution (Gupta & Wales, 2017).

The majority of the previous research has tended to focus on external environmental factors that affect the EO and firm performance relationship (Ireland et al., 2009; Rauch et al., 2009). Contingency theory explicates that the relationship between two variables might be contingent on a third variable. “To decrease the potential for false interpretations, the introduction of moderators into bivariate relationships allows for a better, more precise understanding” (Rosenberg, 1968, p. 100). Therefore, this research could be further extended to examine possible internal moderating factors that would affect the EO and firm performance/risk of failure relationship. Examining internal CEO factors is important to pursue, since there is a gap in the literature regarding exploring the role of managerial characteristics in the EO-performance relationship. Only recently, a study examined the role of managerial discretion (Gupta et al., 2016). There is a need to account for the human agency in understanding the function and performance outcomes from EO.

Considering the human agency context when understanding EO might also challenge the hegemony of EO-as-Advantage view, especially when dark leadership or managerial traits (e.g. CEO overconfidence or greed) are tested on the EO-firm performance relationship. CEOs that display overconfident or greedy personalities are inclined to take more risks and display higher levels of EO (Engelen et al., 2015), which in turn would have adverse effects on firm performance (Haynes et al., 2014). Thereby, a fruitful research avenue could be to examine the moderating effect of CEO overconfidence or greed on the EO-firm performance relationship while controlling for intervening factors that would suppress the managerial impact such as board's power (e.g. Haynes et al., 2014).

Based on upper echelon theory, over time organisations become reflections of their top managers (Hambrick & Mason, 1984). However, CEOs have limited perceptions of a situation, and thus are likely to make subjective decisions based on their own characteristics or past experiences (Hambrick & Mason, 1984). A CEO's personal or cognitive characteristics are based on 'bounded rationality' (Simon, 1957), which can have a major effect on an organisation's strategic decisions (Hambrick & Mason, 1984) and eventually affect its overall performance (Hambrick & Quigley, 2014). The upper echelon literature has tended to focus on simple managerial demographical factors. Furthermore, Haynes et al. (2015) indicated that the literature has predominantly focused on the positive side of entrepreneurial leadership neglecting its negative side. As initially Lumpkin and Dess (1996) argued, the EO-firm performance relationship is more complex than a direct relationship and in effect the examination of contingent moderating dark leadership or CEO traits on the EO-firm performance relationship would provide new insights for the EO literature (Wiklund & Shepherd, 2005).

Second, as we focused on the direct effect of EO on firm performance, we could have missed to consider the antecedents to EO. Most interestingly, in our findings the EO construct and each of the EO dimensions were varying across the years in the time-series figures and were not consistent over time. The dynamic nature of EO was shown by using panel data. This suggests that it is important to know what drives the EO of the firm. Only recently, researchers have started to consider the drivers of EO, in which they found that firm growth trigged the EO of the firm (Eshima & Anderson, 2017). Thereby, perhaps researchers can examine possible antecedents to EO and how such antecedents cause the variations in the exhibition of EO across a longitudinal timeframe.

Third, this thesis has relied on objective proxies for the EO dimensions and the firm performance measures. Even though the objective proxies address the limitations of the subjective EO scale measurement, there are some concerns with objective measurement as well (Dalton and Aguinis; Ketchen et al., 2013).

To address such limitation, a possible research avenue would be to compare the results of the effect of the EO proxies (risk taking, innovativeness, and proactiveness) on firm performance with results of EO using computer-aided textual analysis (CATA). Possibly, content analysis using CATA could be run on a sub-sample of firms for certain years since the validation of proxies through content analysis does not require the usage of the whole sample.

Even though the proxies intended for use in this doctoral research have been outlined in past research, it is important to break from the assumption that these proxies are inherently or intuitively accurate. To prevent the risk of measurement malaise as put forward by Ketchen et al. (2013), it is important to test for such proxies even though other researchers (e.g. Kreiser et al., 2013; Shahzad et al., 2016) have also adopted Miller and Le Breton-Miller's (2011) proxies of the EO dimensions. EO could be comparably measured using content analysis of CEO shareholders letters, which are publicly available, to ensure a reliable measurement of the EO dimensions.

Content analysis using CATA is superior to human analysis of texts since it is free of coder bias and is more reliable and faster (Short et al., 2010). Reliability refers to consistency of measurement, in which CATA method has high test-retest reliability and lacks human error (Short et al., 2010). CATA method of content analysis is more accurate than human-coded analysis. CATA techniques are also faster and allow analysis of multiple texts within minutes. As this doctoral thesis adopts more of a positivist stance, CATA method is more in line with the philosophical position. A content-based measure for EO already exists through the seminal work of Short et al. (2010). Short et al. (2010) provided an example of construct validation by CATA (through DICTION software) using the EO construct. They developed a list of keywords for each of the dimensions of EO. Since then, some studies have also used Short et al. (2010) keywords to capture each of the EO dimensions (e.g. Engelen et al., 2015; Gupta et al., 2016).

Fourth, as with other research studies, the results of this thesis are context-dependent. The findings provide new theoretical extensions to the literature on EO, yet they are relevant to the sample of US large high-tech firms. Future research can extend to examine the longitudinal effect of EO and each of its dimensions on firm performance and risk of failure among a possible sample of firms of different sizes, which belong to different industries, and which could be extended to different country settings.

Fifth, this research has focused only on the three main dimensions of EO without considering the other dimensions, autonomy and competitive aggressiveness, as positioned by Lumpkin and Dess (1996). Most previous research has focused on the three-dimensional conceptualisation of EO by Miller (1983). A possible future research endeavour would be to examine the longitudinal effect of the EO dimensions, autonomy and competitive aggressiveness, on firm performance as well as on risk of failure.

11.5 Chapter Conclusion

This research has advanced the understanding of the outcomes of EO within the context of US large firms in the high-technology industry. The results provide unique novel theoretical implications of the effect of EO and each of its dimensions on firm performance as well as on risk of failure. Through utilising organisational learning and prospect theory, the results of the thesis aligned more with the EO-as-Experimentation perspective. The results further advance our knowledge on the effect of EO on an organisation’s performance and viability by showing that EO’s beneficial effect among the sample of surviving firms decreased as EO increased. Furthermore, this thesis has shown that EO has a positive effect on the risk of failure over time. The postulation by Wiklund and Shepherd (2011), that EO enhances a firm’s performance among surviving firms based on the EO-as-Experimentation perspective, was not supported in this thesis. EO’s beneficial linear effect was not present among surviving firms. The use of large firms provided a neutral setting to examine the effect of EO, since literature have found an inverse U-shaped effect of EO on the performance of small firms. Furthermore, by examining the separate effects of the EO dimensions, it was revealed that innovativeness had a positive effect on long-term performance, yet over time it had a positive effect on firm failure. Lastly, proactiveness and risk taking had a negative effect on long-term performance and a positive effect on failure. These novel results indicate that EO has a double-edged nature, an effect that is not being captured in the literature.

References

Acharya, V. V., Pedersen, L. H., Philippon, T., & Richardson, M. (2017). Measuring systemic risk. *The Review of Financial Studies*, *30*(1), 2-47.

Adams, R. B., & Santos, J. A. C. (2006). Identifying the effect of managerial control on firm performance. *Journal of Accounting and Economics, 41*(1), 55-85.

Ahrens, T., & Chapman, C. S. (2006). Doing qualitative field research in management accounting: Positioning data to contribute to theory. *Accounting, Organizations and Society, 31*(8), 819-841.

Albin, P. S., & Foley, D. K. (1998). *Barriers and bounds to rationality: Essays on economic complexity and dynamics in interactive systems*. Princeton, NJ: Princeton University Press.

Alejo, J., Galvao, A., Montes-Rojas, G., & Sosa-Escudero, W. (2015). Tests for normality in linear panel-data models. *Stata Journal*, *15*(3), 822-832.

Allison, P. D. (2010). *Survival analysis using SAS: a practical guide*. Sas Institute.

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance*, *23*(4), 589-609.

Alvarez, S. A. (2007). Entrepreneurial rents and the theory of the firm. *Journal of Business Venturing*, *22*(3), 427-442.

Alvarez, S. A., & Busenitz, L. W. (2001). The entrepreneurship of resource-based theory. *Journal of Management*, *27*(6), 755-775.

Andersén, J. (2010). A critical examination of the EO-performance relationship. *International Journal of Entrepreneurial Behavior & Research*, *16*(4), 309-328.

Andersén, J. (2017). What about the employees in entrepreneurial firms? A multi-level analysis of the relationship between entrepreneurial orientation, role ambiguity, and social support. *International Small Business Journal*, *35*(8), 969-990.

Anderson, B. S., & Covin, J. G. (2014). Entrepreneurial orientation: disposition and behavior. In A. Fayolle (Ed.), *Handbook of Research On Entrepreneurship: What We Know and What We Need to Know* (pp. 215-237), Edward Elgar Publishing.

Anderson, B. S., Kreiser, P. M., Kuratko, D. F., Hornsby, J. S., & Eshima, Y. (2015). Reconceptualizing entrepreneurial orientation. *Strategic Management Journal*, *36*(10), 1579-1596.

Anderson, R. C. & Reeb, D. (2003). Founding family ownership and firm performance: Evidence from the S&P 500. *Journal of Finance, 58*(3), 1301–1328.

Andrews, A. O., & Welbourne, T. M. (2000). The people/performance balance in IPO firms: The effect of the Chief Executive Officer's financial orientation. *Entrepreneurship Theory and Practice, 25*(1), 93-106.

Antonakis, J., Bendahan, S., Jacquart, P., & Lalive, R. (2014). Causality and endogeneity: Problems and solutions. In D.V. Day (Ed.), The Oxford Handbook of Leadership and Organizations (pp. 93-117). New York: Oxford University Press.

Antonakis, J., & Dietz, J. (2011). Looking for validity or testing it? The perils of stepwise regression, extreme-score analysis, heteroscedasticity, and measurement error. *Personality and Individual Differences, 50,* 409-415.

Antoncic, B., & Hisrich, R. D. (2003). Clarifying the intrapreneurship concept. *Journal of Small Business and Enterprise Development*, *10*(1), 7-24.

Argote, L., & Greve, H. R. (2007). A behavioral theory of the firm—40 years and counting: Introduction and impact. *Organization Science*, *18*(3), 337-349.

Argyris, C., & Schon, D. (1978). *Organizational Learning.* Reading: MA: Addison-Wesley

Atuahene-Gima, K., Slater, S. F., & Olson, E. M. (2005). The contingent value of responsive and proactive market orientations for new product program performance. *Journal of Product Innovation Management*, *22*(6), 464-482.

Audretsch, D. B. (1995). Innovation, growth and survival. *International Journal of Industrial Organization*, *13*(4), 441-457.

Bailey, K. (2008). *Methods of Social Research* (4^{th} ed). Simon and Schuster. Free Press, USA.

Baird, I. S., & Thomas, W. (1990). What is risk anyway? Using and measuring risk in strategic management. In R. A. Bettis & H. Thomas (Eds.), Risk, strategy, and management (pp.21–52). Greenwich, CT: JAI Press.

Baker, W. E., & Sinkula, J. M. (2005). Market orientation and the new product paradox. *Journal of Product Innovation Management*, *22*(6), 483-502.

Baker, M., & Wurgler, J. (2004). A catering theory of dividends. *Journal of Finance*, *59*, 1125-1165.

Baltagi, B. H. (2013). *Econometric analysis of panel data*, 5^{th} edition. New York, USA: John Wiley & Sons.

Barnett, W. P., & Burgelman, R. A. (1996). Evolutionary perspectives on strategy. *Strategic Management Journal*, *17*, 5-19.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99-120.

Barney, J., Wright, M., & Ketchen Jr, D. J. (2001). The resource-based view of the firm: Ten years after 1991. *Journal of Management*, *27*(6), 625-641.

Bateman, T. S., & Crant, J. M. (1993). The proactive component of organizational behavior: A measure and correlates. *Journal of Organizational Behavior*, *14*(2), 103-118.

Bates, T. W., Kahle, K. M., & Stulz, R. M. (2009). Why do US firms hold so much more cash than they used to? *The Journal of Finance*, *64*(5), 1985-2021.

Baum, C. F. (2006). *An introduction to modern econometrics using Stata*. Stata press.

Baum, J. A., & Oliver, C. (1991). Institutional linkages and organizational mortality. *Administrative science quarterly*, 36(2) 187-218.

Bebchuk, L. A., Cremers, K. M., & Peyer, U. C. (2011). The CEO pay slice. *Journal of Financial Economics*, *102*(1), 199-221.

Beck, T., Chen, T., Lin, C., & Song, F. M. (2016). Financial innovation: The bright and the dark sides. *Journal of Banking & Finance*, *72*, 28-51.

Begley, T. M., & Boyd, D. P. (1987). Psychological characteristics associated with performance in entrepreneurial firms and smaller businesses. *Journal of Business Venturing*, *2*(1), 79-93.

Benartzi, S., & Thaler, R. H. (1995). Myopic loss aversion and the equity premium puzzle. *The Quarterly Journal of Economics*, *110*(1), 73-92.

Bernard, H. R. (2012). *Social Research Methods: Qualitative and Quantitative Approaches* (2nd ed.). SAGE. Publications, Inc.

Bhaskar, R. (2013). *A Realist Theory of Science*. Routledge, Taylor & Francis Group. USA.

Bhuian, S. N., Mengucb, B., & Bell, S. J. (2005). Just entrepreneurial enough: the moderating effect of entrepreneurship on the relationship between market orientation and performance. *Journal of Business Research, 58,* 9-17.

Blaikie, N. (2007). *Approaches to Social Enquiry: Advancing Knowledge*. Polity Press, USA.

Blaikie, N. (2009). *Designing Social Research: The Logic of Anticipation* (2nd ed). Polity Press, USA.

Blanche, M. T. Durrheim, K., & Painter, D. (2006). *Research in Practice: Applied Methods for the Social Sciences*. University of Cape Town Press (Pty), Ltd., South Africa.

Boldero, J., & Francis, J. (2002). Goals, standards, and the self: Reference values serving different functions. *Personality and Social Psychology Review*, *6*(3), 232-241.

Bowman, E. H. (1980). A Risk/Return Paradox for Strategic Management. *Sloan Management Review*, *21*(3), 17-31.

Bowman, E. H. (1982). Risk seeking by troubled firms. *Sloan Management Review*, *23*(4), 33-42.

Bowman, E. H. (1984). Content analysis of annual reports for corporate strategy and risk. *Interfaces*, *14*(1), 61-71.

Brady, H. E., Collier, D., & Seawright, J. (2004). Refocusing the Discussion of Methodology. In H. E. Brady, & D. Collier (Eds.), *Rethinking Social Inquiry: Diverse Tools, Shared Standards* (pp. 3-20). Lanham: Rowman and Littlefield.

Breusch, T. S., & Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *The Review of Economic Studies*, *47*(1), 239-253.

Brockhaus, R. H. (1980). Risk taking propensity of entrepreneurs. *Academy of Management Journal*, *23*(3), 509-520.

Bromiley, P. (1991). Testing a causal model of corporate risk taking and performance. *Academy of Management Journal*, *34*(1), 37-59.

Brown, J. S., & Duguid, P. (1991). Organizational Learning and Communities-of-Practice: Toward a Unified View of Working, Learning, and Innovation. *Organization Science*, *2*(1), 40-57.

Bruderl, J., & Schussler, R. (1990). Organizational mortality: The liabilities of newness and adolescence. *Administrative Science Quarterly*, *35*(3), 530-547.

Bryman, A. (2015). *Social Research Methods*. Oxford University Press.

Bryman, A., & Bell, E. (2015). *Business Research Methods*. Oxford University Press, USA.

Burgelman, R. A. (1991). Intraorganizational ecology of strategy making and organizational adaptation: Theory and field research. *Organization Science*, *2*(3), 239-262.

Burgelman R. A., & Maidique M. A. (1989). *Strategic Management of Technology*. Homewood, IL: Irwin.

Burgelman, R. A., & Sayles, L. R. (1986). *Inside corporate innovation strategy, structure and managerial skills.* New York: The Free Press.

Busenitz, L. W., & Barney, J. B. (1997). Differences between entrepreneurs and managers in large organizations: Biases and heuristics in strategic decision-making. *Journal of Business Venturing*, *12*(1), 9-30.

Calantone, R. J., Cavusgil, S. T., & Zhao, Y. (2002). Learning orientation, firm innovation capability, and firm performance. *Industrial Marketing Management*, *31*(6), 515-524.

Campbell, J. T., Campbell, T. C., Sirmon, D. G., Bierman, L., & Tuggle, C. (2012). Shareholder influence over director nomination via proxy access: Implications for agency conflict and stakeholder value. *Strategic Management Journal*, *33*(12), 1431-1451.

Campbell, T. C., Gallmeyer, M., Johnson, S. A., Rutherford, J., & Stanley, B. W. (2011). CEO optimism and forced turnover. *Journal of Financial Economics, 101*(3), 695-712.

Cameron, C. A., & Trivedi, P. K. (2010). Microeconomics using stata revised edition. *StataCorp*.

Cangelosi, V. E., & Dill, W. R. (1965). Organizational learning: Observations toward a theory. *Administrative Science Quarterly*, *10*, 175-203.

Carpenter, M. A., Geletkanycz, M. A., & Sanders, W. G. (2004). Upper echelons research revisited: Antecedents, elements, and consequences of top management team composition. *Journal of Management*, *30*(6), 749-778.

Carpenter, M. A., Sanders, W. G., & Gregersen, H. B. (2001). Bundling human capital with organizational context: The impact of international assignment experience on multinational firm performance and CEO pay. *Academy of Management Journal*, *44*(3), 493-511.

Carver, C. S., & Scheier, M. F. (1982). Control theory: A useful conceptual framework for personality–social, clinical, and health psychology. *Psychological Bulletin*, *92*(1), 111-135.

Cefis, E., & Marsili, O. (2005). A matter of life and death: innovation and firm survival. *Industrial and Corporate Change*, *14*(6), 1167-1192.

Certo, S. T., Moss, T. W., & Short, J. C. (2009). Entrepreneurial orientation: An applied perspective. *Business Horizons, 52*(4), 319–324.

Chan, S. H., Martin, J. D., & Kensinger, J. W. (1990). Corporate research and development expenditures and share value. *Journal of Financial Economics*, *26*(2), 255-276.

Chaston, I. (1997). Small firm performance: Assessing the interaction between entrepreneurial style and organizational structure. *European Journal of Marketing*, *31*(11/12), 814-831.

Chatterjee, A., & Hambrick, D. C. (2007). It's all about me: Narcissistic chief executive officers and their effects on company strategy and performance. *Administrative Science Quarterly*, *52*(3), 351-386.

Charitou, A., Neophytou, E., & Charalambous, C. (2004). Predicting corporate failure: empirical evidence for the UK. *European Accounting Review*, *13*(3), 465-497.

Chen, G., Crossland, C., & Luo, S. (2015). Making the same mistake all over again: CEO overconfidence and corporate resistance to corrective feedback. *Strategic Management Journal*, *36*(10), 1513-1535.

Cheng, Y. T., & Van de Ven, A. H. (1996). Learning the innovation journey: Order out of chaos? *Organization Science*, *7*(6), 593-614.

Chou, P. H., Chou, R. K., & Ko, K. C. (2009). Prospect theory and the risk-return paradox: some recent evidence. *Review of Quantitative Finance and Accounting*, *33*(3), 193-208.

Coad, A., & Rao, R. (2008). Innovation and firm growth in high-tech sectors: A quantile regression approach. *Research policy*, *37*(4), 633-648.

Cohen, J. (1992). Statistical power analysis. *Current Directions in Psychological Science*, *1*(3), 98-101.

Cohen, W. M., & Levinthal, D. A. (1989). Innovation and learning: the two faces of R&D. *The Economic Journal*, *99*(397), 569-596.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, *35*(1), 128-152.

Corbetta, P. (2003). *Social research: Theory, methods and techniques*. London: Sage.

Covin, J. G., Green, K. M., & Slevin, D. P. (2006). Strategic process effects on the entrepreneurial orientation-sales growth rate relationship. *Entrepreneurship Theory and Practice, 30*, 57-81.

Covin, J.G., & Lumpkin, G.T. (2011). Entrepreneurial orientation theory and research: Reflections on a needed construct. *Entrepreneurship Theory and Practice*, *35*(5), 855-872.

Covin, J. G., & Miles, M. P. (1999). Corporate entrepreneurship and the pursuit of competitive advantage. *Entrepreneurship Theory and Practice, 23*(3), 47-63.

Covin, J. G., & Miller, D. (2014). International entrepreneurial orientation: conceptual considerations, research themes, measurement issues, and future research directions. *Entrepreneurship Theory and Practice*, *38*(1), 11-44.

Covin, J. G., & Slevin, D. P. (1988). The influence of organization structure on the utility of and entrepreneurial top management style. *Journal of Management Studies, 25*, 217-234.

Covin, J. G., & Slevin, D. P. (1989). Strategic management of small firms in hostile and benign environments. *Strategic Management Journal, 10*, 75-87.

Covin, J. G., & Slevin, D. P. (1990). New venture strategic posture, structure, and performance: An industry life cycle analysis. *Journal of Business Venturing, 5*(2), 123-135.

Covin, J. G., & Slevin, D. P. (1991). A conceptual model of entrepreneurship as firm behavior. *Entrepreneurship Theory and Practice*, *16*(1), 7-25.

Covin, J. G., Slevin, D. P., & Covin, T. J. (1990). Content and performance of growth-seeking strategies: A comparison of small firms in high- and low-technology industries. *Journal of Business Venturing, 5(6),* 391-412.

Covin, J. G., Slevin, D. P., & Schultz, R. L. (1994). Implementing strategic missions: Effective strategic, structural and tactical choices. *Journal of Management Studies*, *31*(4), 481-506.

Covin, J. G., & Wales, W. J. (2012). The measurement of entrepreneurial orientation. *Entrepreneurship Theory and Practice*, *36*, 677-702.

Cox, D. R. (1972). Regression models and life-tables. *Journal of the Royal Statistical Society. Series B (Methodological), 34*(2), 187-220.

Cox, D. R., & Oakes, D. (1984). Analysis of survival data. 1984. *Chapman & Hall, London*.

Crant, J. M. (2000). Proactive behavior in organizations. *Journal of Management*, *26*(3), 435-462.

Creswell, J. W. (2013). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches* (3rd ed.). Thousand Oaks, CA: Sage.

Crossan, M. M., & Berdrow, I. (2003). Organizational learning and strategic renewal. *Strategic Management Journal*, *24*(11), 1087-1105.

Crossan, M. M., Lane, H. W., White, R. E., & Djurfeldt, L. (1995). Organizational learning: Dimensions for a theory. *The International Journal of Organizational Analysis*, *3*(4), 337-360.

Crossan, M. M., Lane, H. W., & White, R. E. (1999). An organizational learning framework: From intuition to institution. *Academy of Management Review*, *24*(3), 522-537.

Crossan, M. M., Maurer, C. C., & White, R. E. (2011). Reflections on the 2009 AMR decade award: do we have a theory of organizational learning? *Academy of Management Review*, *36*(3), 446-460.

Cyert, R. M., & March, J. G. (1963). *A behavioral theory of the firm*. Prentice Hall, Englewood Cliffs, NJ.

Dai, L., Maksimov, V., Gilbert, B. A., & Fernhaber, S. A. (2014). Entrepreneurial orientation and international scope: The differential roles of innovativeness, proactiveness, and risk-taking. *Journal of Business Venturing*, *29*(4), 511-524.

Dalton, D. R., & Aguinis, H. (2013). Measurement Malaise in Strategic Management Studies The Case of Corporate Governance Research. *Organizational Research Methods*, *16*(1), 88-99.

Danneels, E. (2002). The dynamics of product innovation and firm competences. *Strategic Management Journal*, *23*(12), 1095-1121.

Dass, N., Nanda, V., & Xiao, S. C. (2017). Truncation bias corrections in patent data: Implications for recent research on innovation. *Journal of Corporate Finance, 44*, 353-374.

Davidsson, P., Steffens, P., & Fitzsimmons, J. (2009). Growing profitable or growing from profits: Putting the horse in front of the cart? *Journal of Business Venturing*, *24*(4), 388-406.

Day, G. S. (1994). The capabilities of market-driven organizations. *The Journal of Marketing*, *58*, 37-52.

De Bonis, R., Giustiniani, A., & Gomel, G. (1999). Crises and bail outs of banks and countries: Linkages, analogies, and differences. *The World Economy*, *22*(1), 55-86.

De Geus A. P. (1988). Planning as learning. *Harvard Business Review, 66*(2), 70–74.

De Vaus, D. A. (2001). *Research Design in Social Research.* SAGE Publications, Ltd., London.

Della Porta, D., & Keating, M. (2008). *Approaches and methodologies in the social sciences: A pluralist perspective*. Cambridge University Press.

Denrell, J. (2003). Vicarious learning, undersampling of failure, and the myths of management. *Organization Science*, *14*(3), 227-243.

Dess, G. G., Ireland, R. D., Zahra, S. A., Floyd, S. W., Janney, J. J., & Lane, P. J. (2003). Emerging issues in corporate entrepreneurship. *Journal of Management*, *29*(3), 351-378.

Dess, G. G., & Lumpkin, G. T. (2005). The role of entrepreneurial orientation in stimulating effective corporate entrepreneurship. *The Academy of Management Executive*, *19*(1), 147-156.

Dess, G. G., Lumpkin, G. T., & Covin, J. G. (1997). Entrepreneurial strategy making and firm performance: Tests of contingency and configurational models. *Strategic Management Journal, 18,* 677-695.

Dodgson, M. (1991). Technology learning, technology strategy and competitive pressures. *British Journal of Management*, *2*(3), 133-149.

Dodgson, M. (1993). Organizational learning: a review of some literatures. *Organization Studies*, *14*(3), 375-394.

Doğan, V. (2013). Analysis of scientific realism in the dichotomy between positivism and anti-positivism: An implication for social sciences. *International Journal of Business and Social Science*, *4*(6), 248-256.

Droge, C., Calantone, R., & Harmancioglu, N. (2008). New product success: Is it really controllable by managers in highly turbulent environments? *Journal of Product Innovation Management*, *25*(3), 272-286.

Drukker, D. M. (2003). Testing for serial correlation in linear panel-data models. *Stata Journal*, *3*(2), 168-177.

Dushnitsky, G., & Lenox, M. J. (2006). When does corporate venture capital investment create firm value?. *Journal of Business Venturing*, *21*(6), 753-772.

Easterby-Smith, M. (1997). Disciplines of organizational learning: contributions and critiques. *Human Relations*, *50*(9), 1085-1113.

Easterby-Smith, M., Thorpe, R., & Jackson, P. R. (2012). *Management Research*. SAGE Publications.

Edmond, V. & Wiklund, J. (2010). The historic roots of entrepreneurial orientation research. In H. Landstrom & F. Lohrke (Eds.), *The Historical Foundations of Entrepreneurship Research* (pp. 142–160). Cheltenham, U.K.: Edward Elgar.

Edmondson, A., & Moingeon, B. (1998). From organizational learning to the learning organization. *Management Learning*, *29*(1), 5-20.

Efron, B. (1977). The efficiency of Cox's likelihood function for censored data. *Journal of the American Statistical Association*, *72*(359), 557-565.

Eisenhardt, K. M. (1989). Making fast strategic decisions in high-velocity environments. *Academy of Management Journal*, *32*(3), 543-576.

Engelen, A., Kube, H., Schmidt, S., & Flatten, T. C. (2014). Entrepreneurial orientation in turbulent environments: The moderating role of absorptive capacity. *Research Policy*, *43*(8), 1353-1369.

Engelen, A., Neumann, C., & Schwens, C. (2015). “Of course I can”: The effect of CEO overconfidence on entrepreneurially oriented firms. *Entrepreneurship Theory and Practice*, *39*(5), 1137-1160.

Engelen, E., Ertürk, I., Froud, J., Sukhdev, J., Leaver, A., Moran, M., Nilsson, A., & Williams, K. (2011). *After the Great Complacence: Financial Crisis and the Politics of Reform*. Oxford: Oxford University Press.

Eshima, Y., & Anderson, B. S. (2017). Firm growth, adaptive capability, and entrepreneurial orientation. *Strategic Management Journal*, *38*(3), 770-779.

Fama, E. F. (1968). Risk, return and equilibrium: some clarifying comments. *The Journal of Finance*, *23*(1), 29-40.

Fama, E. F., & French, K. R. (1997). Industry costs of equity. *Journal of Financial Economics*, *43*, 153-193.

Farewell, V. T., & Prentice, R. L. (1980). The approximation of partial likelihood with emphasis on case-control studies. *Biometrika*, *67*(2), 273-278.

Fiegenbaum, A. (1990). Prospect theory and the risk-return association: An empirical examination in 85 industries. *Journal of Economic Behavior & Organization*, *14*(2), 187-203.

Fiegenbaum, A., & Thomas, H. (1988). Attitudes toward risk and the risk–return paradox: prospect theory explanations. *Academy of Management Journal*, *31*(1), 85-106.

Fiol, C. M., & Lyles, M. A. (1985). Organizational learning. *Academy of Management Review*, *10*(4), 803-813.

Fisher, I. N., & Hall, G. R. (1969). Risk and corporate rates of return. *The Quarterly Journal of Economics*, 79-92.

Freiberger, P., & Swaine, M. (1999). *Fire in the Valley: the making of the personal computer*. McGraw-Hill Professional.

Galbraith, J. R. (1977). *Organizational Design*. Reading, MA: Addison-Wesley.

Gao, L., Yang, L. L., & Zhang, J. H. (2015). Corporate patents, R&D success, and tax avoidance. *Review of Quantitative Finance and Accounting*, 1-34. DOI:10.1007/s11156-015-0531-3.

Garcia-Morales, V. J., Llorens-Montes, F. J., & Verdú-Jover, A. J. (2006). Antecedents and consequences of organizational innovation and organizational learning in entrepreneurship. *Industrial Management & Data Systems*, *106*(1), 21-42.

Garud, R., & Nayyar, P. R. (1994). Transformative capacity: Continual structuring by intertemporal technology transfer. *Strategic Management Journal*, *15*(5), 365-385.

Garvin, D. A. (1993). Building a learning organization. *Harvard Business Review*, *71*(4), 78-91.

George, B. A., & Marino, L. (2011). The epistemology of entrepreneurial orientation: Conceptual formation, modeling, and operationalization. *Entrepreneurship Theory and Practice*, *35*(5), 989-1024.

Gill, J., & Johnson, P. (1997). *Research Methods for Managers*, 2nd Ed. Paul Chapman Publishing, London.

Gimeno, J., Folta, T., Cooper, A., & Woo, C. (1997). Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Administrative Science Quarterly*, *42*(4), 750–783.

Grambsch, P. M., & Therneau, T. M. (1994). Proportional hazards tests and diagnostics based on weighted residuals. *Biometrika*, *81*(3), 515-526.

Grant, R. M. (1995). *Contemporary strategy analysis: Concepts, techniques, applications,* second ed, Cambridge, MA: Blackwell Publishers Inc.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, *17*, 109-122.

Greenough, P., & Lynch, M. P. (2006). *Truth and Realism*. Oxford University Press.

Griffith, D. A., Noble, S. M., & Chen, Q. (2006). The performance implications of entrepreneurial proclivity: A dynamic capabilities approach. *Journal of Retailing, 82*(1), 51-62.

Grix, J. (2002), Introducing students to the generic terminology of social research. *Politics*, 22, 175-186.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 105-117). London: Sage.

Gujarati, D. N. (2003). *Basic Econometrics*, 4th edition. McGraw-Hill Inc., US.

Gupta, V. K. (2015). Construction of entrepreneurial orientation: dispute, demand, and dare. *New England Journal of Entrepreneurship*, *18*(1), 87.

Gupta, V., Mortal, S. C., & Yang, T. (2016). Entrepreneurial orientation and firm value: Does managerial discretion play a role? *Review of Managerial Science*, 1-26.

Gupta, V. K., & Dutta, D. K. (2016). Inquiring into entrepreneurial orientation: Making progress, one step at a time. *New England Journal of Entrepreneurship, 19*(2), 1-6.

Gupta, V. K., & Gupta, A. (2015). Relationship between entrepreneurial orientation and firm performance in large organizations over time. *Journal of International Entrepreneurship*, *13*(1), 7-27.

Gupta R., & Sebastian V. J. (2014). Composition, Dimensional Issue and Nature of Entrepreneurial Orientation (EO) Construct. *Asia-Pacific Journal of Business*, *5*(1), 23-31.

Gupta, V. K., & Wales, W. J. (2017). Assessing organisational performance within entrepreneurial orientation research: Where have we been and where can we go from here? *The Journal of Entrepreneurship*, *26*(1), 1-26.

Haans, R. F., Pieters, C. & He, Z. L. (2016). Thinking about U: Theorizing and testing U-and inverted U-shaped relationships in strategy research. *Strategic Management Journal, 37*(7), 1177-1195.

Hall, B. H. (1999). *Innovation and market value*. National Bureau of Economic Research. doi:10.3386/w6984.

Hall, B. H., Jaffe, A., & Trajtenberg, M. (2005). Market value and patent citations. *RAND Journal of Economics*, *36*(1), 16-38.

Hambrick, D. C., & D'Aveni, R. A. (1988). Large corporate failures as downward spirals. *Administrative Science Quarterly*, *33*, 1-23.

Hambrick, D. C., & Mason, P. A. (1984). Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review, 9*(2), 193-106.

Hambrick, D. C., & Quigley, T. J. (2014). Toward more accurate contextualization of the CEO effect on firm performance. *Strategic Management Journal*, *35*(4), 473-491.

Hamel, G. (1991). Competition for competence and interpartner learning within international strategic alliances. *Strategic Management Journal*, *12,* 83-103.

Hamel, G., & Prahalad, C. K. (1990). Strategic intent. *Harvard Business Review*, *68*(3), 18-38.

Hamel, G., & Prahalad, C. K. (1991). Corporate imagination and expeditionary marketing. *Harvard Business Review*, *69*(4), 81-92.

Hamel, G., & Prahalad, C. K. (1994). *Competing for the future.* Boston: Harvard Business School Press.

Hamilton, L. C. (2012). *Statistics with Stata: version 12*. Cengage Learning.

Hamlyn, D. W. (1995). Epistemology, history of. In T. Honderich (Ed.), *The Oxford companion to philosophy* (pp. 242-245), Oxford University Press, Oxford.

Han, J. K., Kim, N., & Srivastava, R. K. (1998). Market orientation and organizational performance: is innovation a missing link? *The Journal of Marketing, 62*, 30-45.

Hannan, M. T., & Freeman, J. (1984). Structural inertia and organizational change. *American Sociological Review*, *49*(2), 149-164.

Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica: Journal of the Econometric Society*, *50*(4), 1029-1054.

Harford, J., & Li, K. (2007). Decoupling wealth and firm performance: The case of acquiring CEOs. *The Journal of Finance, 62*(2), 917–949.

Harford, J., Mansi, S., & Maxwell, W. (2008). Corporate governance and firm cash holdings in the US. *Journal of Financial Economics*, *87*, 535-555.

Harvey, C., & Denton, J. (1999). To come of age: the antecedents of organizational learning. *Journal of Management Studies*, *36*(7), 897-918.

Hausman, J. A. (1978). Specification Tests in Econometrics. *Econometrica, 46*(6), 1251-1271.

Hay, C. (2002). *Political Analysis: A Critical Introduction*. Basingstoke, Palgrave Macmillan.

Haynes, K. T., Campbell, J., & Hitt, M. A. (2014). When more is not enough: executive greed and its influence on shareholder wealth. *Journal of Management*, 1-30. doi:10.1177/0149206314535444.

Haynes, K. T., Hitt, M. A., & Campbell, J. T. (2015). The dark side of leadership: Towards a mid-range theory of hubris and greed in entrepreneurial contexts. *Journal of Management Studies, 52*(4), 479-505.

He, Z. L., & Wong, P. K. (2004). Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organization science*, *15*(4), 481-494.

Hedberg, B. L. T. (1981). How Organizations Learn and Unlearn. In P. C. Nystrom & W. H. Starbuck (Eds.), *Handbook of Organizational Design. Volume I.* New York: Oxford University Press.

Hilary, G., & Hsu, C. (2011). Endogenous overconfidence in managerial forecasts. *Journal of Accounting and Economics, 51*(3), 300-313.

Hill, C. W., & Snell, S. A. (1989). Effects of ownership structure and control on corporate productivity. *Academy of Management Journal*, *32*(1), 25-46.

Hjorth, D., Jones, C., & Gartner, W. B. (2008). Introduction for Recreating/ Recontextualising Entrepreneurship. *Scandinavian Journal of Management*, *24*(2), 81-84.

Hoberg, G., & Prabhala, N. R. (2009). Disappearing dividends, catering, and risk. *Review of Financial Studies*, *22*(1), 79-116.

Holden, M. T., & Lynch, P. (2004). Choosing the appropriate methodology: understanding research philosophy. *The Marketing Review*, *4*(4), 397-409.

Holmqvist, M. (2004). Experiential learning processes of exploitation and exploration within and between organizations: An empirical study of product development. *Organization science*, *15*(1), 70-81.

Holmstrom, B. (1989). Agency costs and innovation. *Journal of Economic Behavior and Organization, 12*, 305-327.

Hough, J., & Scheepers, R. (2008). Creating corporate entrepreneurship through strategic leadership. *Journal of Global Strategic Management*, *2*(1), 17-25.

Hribar, P., & Yang, H. (2015). CEO overconfidence and management forecasting. *Contemporary Accounting Research*, *33*(1), 204-227.

Hsiao, C. (2014). *Analysis of Panel Data*, 3rd edition. Cambridge, University Press.

Huang, R., & Ramirez, G. G. (2010). Speed of issuance, lender specialization, and the rise of the 144a debt market. *Financial Management, 39*, 643-673.

Huber, G. P. (1991). Organizational learning: The contributing processes and the literatures. *Organization Science*, *2*(1), 88-115.

Hughes, M., & Morgan, R. E. (2007). Deconstructing the relationship between entrepreneurial orientation and business performance at the embryonic stage of firm growth. *Industrial Marketing Management*, *36*, 651-661.

Hughes, M., Eggers, F., Kraus, S., & Hughes, P. (2015). The relevance of slack resource availability and networking effectiveness for entrepreneurial orientation. *International Journal of Entrepreneurship and Small Business*, *26*(1), 116-138.

Hughes, M., Hughes, P., Mellahi, K., & Guermat, C. (2010). Short-term versus long-term impact of managers: Evidence from the football industry. *British Journal of Management*, *21*(2), 571-589.

Hughes, M., Hughes, P., & Morgan, R. E. (2007). Exploitative learning and entrepreneurial orientation alignment in emerging young firms: Implications for market and response performance. *British Journal of Management*, *18*(4), 359-375.

Hunt, S. D. (2005). For truth and realism in management research. *Journal of Management Inquiry*, *14*(2), 127-138.

Hurley, R. F., & Hult, G. T. M. (1998). Innovation, market orientation, and organizational learning: an integration and empirical examination. *The Journal of Marketing*, *62*(3) 42-54.

Hyytinen, A., Pajarinen, M., & Rouvinen, P. (2015). Does innovativeness reduce startup survival rates? *Journal of Business Venturing*, *30*(4), 564-581.

Ireland, R. D., Hitt, M. A., & Sirmon, D. G. (2003). A model of strategic entrepreneurship: The construct and its dimensions. *Journal of management*, *29*(6), 963-989.

Ireland, R. D., Covin, J. G., & Kuratko, D. F. (2009). Conceptualizing corporate entrepreneurship strategy. *Entrepreneurship theory and practice*, *33*(1), 19-46.

Jackman, R. W. (1985). Cross-national statistical research and the study of comparative politics. *American Journal of Political Science*, *29*(1), 161-182.

Jambulingam, T., Kathuria, R., & Doucette, W. R. (2005). Entrepreneurial orientation as a basis for classification within a service industry: the case of retail pharmacy industry. *Journal of Operations Management*, *23*(1), 23-42.

Jegers, M. (1991). Prospect theory and the risk-return relation: Some Belgian evidence. *Academy of Management Journal*, *34*(1), 215-225.

Jensen, M. C. (1986). Agency cost of free cash flow, corporate finance, and takeovers. *American Economic Review*, *76*(2), 323-329.

Josefy, M. A., Harrison, J. S., Sirmon, D. G., & Carnes, C. (2017). Living and dying: Synthesizing the literature on firm survival and failure across stages of development. *Academy of Management Annals*, *11*(2), 770-799.

Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, *47*(2), 263-292.

Kahneman, D., & Tversky, A. (Eds.). (2000). *Choices, values, and frames*. Cambridge University Press and the Russell Sage Foundation: New York.

Kanter, R. M. (1984). Innovation: the only hope for times ahead. *Sloan Management Review, 25*(4), 51-55.

Kaplan, E. L., & Meier, P. (1958). Nonparametric estimation from incomplete observations. *Journal of the American Statistical Association*, *53*(282), 457-481.

Kaplan, S. N. & Zingales, L. (1997). Do investment-cash flow sensitivities provide useful measures of financing constraints? *Quarterly Journal of Economics, 112*(1), 169–215.

Karapandza, R. (2016). Stock returns and future tense language in 10-K reports. *Journal of Banking & Finance*, *71*, 50-61.

Karmann, T., Mauer, R., Flatten, T. C., & Brettel, M. (2016). Entrepreneurial orientation and corruption. *Journal of Business Ethics*, *133*(2), 223-234.

Keat, R., & Urry, J. (2011). *Social Theory as Science (Routledge Revivals)*. Routledge.

Keele, L. (2010). Proportionally difficult: testing for nonproportional hazards in Cox models. *Political Analysis*, *18*(2), 189-205.

Kemelgor, B. H. (2002). A comparative analysis of corporate entrepreneurial orientation between selected firms in the Netherlands and the USA. *Entrepreneurship & Regional Development, 14*(1), 67-87.

Kennedy, P. (2003). *A guide to econometrics*. Cambridge, MA: MIT Press.

Ketchen, D. J., Ireland, R. D., & Baker, L. T. (2013). The Use of Archival Proxies in Strategic Management Studies Castles Made of Sand? *Organizational Research Methods*, *16*(1), 32-42.

Ketchen, D. J., Ketchen Jr, D. J., & Bergh, D. D. (Eds.). (2006). *Research Methodology in Strategy and Management*. Emerald Group Publishing.

Khandwalla, P. N. (1976/77). Some top management styles, their context and performance. *Organization and Administrative Sciences, 7*(4), 21-51.

Kim, H., Hoskisson, R. E., & Wan, W. P. (2004). Power dependence, diversification strategy, and performance in keiretsu member firms. *Strategic Management Journal, 25*, 613-636.

Klein, A. (2002). Audit committee, board of director characteristics, and earnings management. *Journal of Accounting and Economics*, *33*(3), 375-400.

Knight F. H. (1921). *Risk, Uncertainty, and Profit*. Harper & Row: New York.

Knight, G. A. (1997). Cross-cultural reliability and validity of a scale to measure firm entrepreneurial orientation. *Journal of Business Venturing*, *12*(3), 213-225.

Knights, D., & McCabe, D. (2015). Masters of the universe: demystifying leadership in the context of the 2008 Global Financial Crisis. *British Journal of*

Management, *26*(2), 197-210.

Kogan, L., Papanikolaou, D., Seru, A., & Stoffman, N. (2012). Technological innovation, resource allocation, and growth. *Working Paper 17769*.

Koryak, O., Lockett, A., Hayton, J., Nicolaou, N., & Mole, K. (2018). Disentangling the antecedents of ambidexterity: Exploration and exploitation. *Research Policy*, *47*(2), 413-427.

Kraus, S., Rigtering, J. C., Hughes, M., & Hosman, V. (2012). Entrepreneurial orientation and the business performance of SMEs: a quantitative study from the Netherlands. *Review of Managerial Science*, *6*(2), 161-182.

Kreiser, P. M., & Davis, J. (2010). Entrepreneurial orientation and firm performance: The unique impact of innovativeness, proactiveness, and risk-taking. *Journal of Small Business & Entrepreneurship*, *23*(1), 39-51.

Kreiser, P., Marino, L., & Weaver, K. (2002). Assessing the psychometric properties of the entrepreneurial orientation scale: A multi-country analysis. *Entrepreneurship Theory and Practice*, *26*(4), 71-95.

Kreiser, P. M., Marino, L. D., Kuratko, D. F., & Weaver, K. M. (2013). Disaggregating entrepreneurial orientation: the non-linear impact of innovativeness, proactiveness and risk-taking on SME performance. *Small Business Economics*, *40*(2), 273-291.

Kuratko, D. F., Montagno, R. V., & Hornsby, J. S. (1990). Developing an intrapreneurial assessment instrument for an effective corporate entrepreneurial environment. *Strategic Management Journal*, *11*, 49-58.

Lang, L. H., & Stulz, R. M. (1994). Tobin's q, corporate diversification, and firm performance. *Journal of Political Economy*, *102*(6), 1248-1280.

Lant, T. K., & Mezias, S. J. (1990). Managing discontinuous change: A simulation study of organizational learning and entrepreneurship. *Strategic Management Journal*, *11*, 147-179.

Lant, T. K., Milliken, F. J., & Batra, B. (1992). The role of managerial learning and interpretation in strategic persistence and reorientation: An empirical exploration. *Strategic Management Journal*, *13*(8), 585-608.Lawson, T. (2008).

What has realism got to do with it? In D. M. Hausman (Ed.), *The philosophy of economics: An anthology* (3rd ed., pp. 439-454). UK: Cambridge University Press.

Lechner, C., & Gudmundsson, S. V. (2014). Entrepreneurial orientation, firm strategy and small firm performance. *International Small Business Journal*, *32*(1), 36-60.

LeClere, M. J. (2000). The occurrence and timing of events: Survival analysis applied to the study of financial distress. *Journal of Accounting Literature*, *19*, 158-189.

LeClere, M. J. (2005). Time-dependent and time-invariant covariates within a proportional hazards model: A financial distress application. *Review of Accounting and Finance*, *4*(4), 91-109.

Lee, P. M. & O'Neill, H. M. (2003). Ownership structures and R&D investments of US and Japanese firms. *Academy of Management Journal*, *46*(2), 212–225.

Lee, J. (2003). Innovation and strategic divergence: An empirical study of the US pharmaceutical industry from 1920 to 1960. *Management Science*, *49*(2), 143-159.

Lei, D., Hitt, M. A., & Bettis, R. (1996). Dynamic core competences through meta-learning and strategic context. *Journal of Management*, *22*(4), 549-569.

Leitch, C. M., Hill, F. M., & Harrison, R. T. (2009). The philosophy and practice of interpretivist research in entrepreneurship: Quality, validation, and trust. *Organizational Research Methods*, *13*, 67-84.

Levinthal, D. A. (1991). Random walks and organizational mortality. *Administrative Science Quarterly*, *36*(3), 397-420.

Levinthal, D. A., & March, J. G. (1981). A model of adaptive organizational search. *Journal of Economic Behavior & Organization*, *2*(4), 307-333.

Levinthal, D. A., & March, J. G. (1993). The myopia of learning. *Strategic Management Journal*, *14*(, 95-112.

Levitt, B., & March, J. G. (1988). Organizational learning. *Annual review of sociology*, *14*(1), 319-338.

Li, G. C., Lai, R., D'Amour, A., Doolin, D. M., Sun, Y., Torvik, V. I., Amy, Z. Y., & Fleming, L. (2014). Disambiguation and co-authorship networks of the US patent inventor database (1975–2010). *Research Policy*, *43*(6), 941-955.

Li, H., & Atuahene-Gima, K. (2001). Product innovation strategy and the performance of new technology ventures in China. *Academy of Management Journal*, *44*(6), 1123-1134.

Lin, B. W., Lee, Y., & Hung, S. C. (2006). R&D intensity and commercialization orientation effects on financial performance. *Journal of Business Research*, *59*(6), 679-685.

Lin, D. Y., Wei, L. J., & Ying, Z. (1993). Checking the Cox model with cumulative sums of martingale-based residuals. *Biometrika*, *80*(3), 557-572.

Lind, J. T., & Mehlum, H. (2010). With or without U? the Appropriate Test for a U-Shaped Relationship. *Oxford Bulletin of Economics and Statistics*, *72*(1), 109-118.

Lindenberg, E. B., & Ross, S. A. (1981). Tobin's q ratio and industrial organization. *Journal of business*, 1-32.

Lipshitz, R., Popper, M., & Friedman, V. J. (2002). A multifacet model of organizational learning. *The Journal of Applied Behavioral Science*, *38*(1), 78-98.

Lomberg, C., Urbig, D., Stöckmann, C., Marino, L. D., & Dickson, P. H. (2017). Entrepreneurial orientation: the dimensions' shared effects in explaining firm performance. *Entrepreneurship Theory and Practice*, *41*(6), 973-998.

Longhi, S., & Nandi, A. (2014). *A practical guide to using panel data*. Sage.

Loughran, T., & Ritter, J. (2004). Why has IPO underpricing change over time?, *Financial Management 33*, 5-37.

Loviscek, A., & Riley, E. (2013). The impact of the global financial crisis on firm-level risk of the S&P 500. *Managerial Finance*, *39*(7), 641-652.

Lumley, T., Diehr, P., Emerson, S., & Chen, L. (2002). The importance of the normality assumption in large public health data sets. *Annual Review of Public Health*, *23*(1), 151-169.

Lumpkin, G. T., Brigham, K. H., & Moss, T. W. (2010). Long-term orientation: Implications for the entrepreneurial orientation and performance of family businesses. *Entrepreneurship and Regional Development*, *22*(3-4), 241-264.

Lumpkin, G. T., Cogliser, C. C., & Schneider, D. R. (2009). Understanding and measuring autonomy: An entrepreneurial orientation perspective. *Entrepreneurship Theory and Practice*, *33*(1), 47-69.

Lumpkin, G. T., & Dess, G. G. (1996). Clarifying the entrepreneurial orientation construct and linking it to performance. *The Academy of Management Review*, *21*, 135-172.

Lumpkin, G. T., & Dess, G. G. (2001). Linking two dimensions of entrepreneurial orientation to firm performance: The moderating role of environment and industry life cycle. *Journal of Business Venturing*, *16*(5), 429-451.

Lyon, D. W., Lumpkin, G. T., & Dess, G. G. (2000). Enhancing entrepreneurial orientation research: Operationalizing and measuring a key strategic decision making process. *Journal of Management*, *26*, 1055-1085.

Malmendier, U., & Tate, G. (2005). CEO overconfidence and corporate investment. *Journal of Finance, 60*(6), 2661-2700.

March, J. G. (1981). Footnotes to organizational change. *Administrative Science Quarterly*, 563-577.

March, J. G. (1988). Variable risk preferences and adaptive aspirations. *Journal of Economic Behavior & Organization*, *9*(1), 5-24.

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, *2*(1), 71-87.

March, J. G. (2006). Rationality, foolishness, and adaptive intelligence. *Strategic Management Journal*, *27*(3), 201-214.

March, J. G., & Olsen, J. P. (1975). The uncertainty of the past: Organizational learning under ambiguity. *European Journal of Political Research*, *3*(2), 147-171.

March, J. G., & Shapira, Z. (1987). Managerial perspectives on risk and risk taking. *Management Science*, *33*(11), 1404-1418.

March, J. G., & Simon, H. A. (1958). *Organizations*. Wiley, New York.

Marengo, L. (1993). Knowledge distribution and coordination in organizations: On some social aspects of the exploitation vs. exploration trade-off. Revue Internationale de Systimique, *7*, 553-571.

Martens, C. D. P., Lacerda, F. M., Belfort, A. C., & Freitas, H. M. R. D. (2016). Research on entrepreneurial orientation: current status and future agenda. *International Journal of Entrepreneurial Behavior & Research*, *22*(4), 556-583.

Matsuno, K., Mentzer, J. T., & Özsomer, A. (2002). The effects of entrepreneurial proclivity and market orientation on business performance. *Journal of Marketing*, *66*(3), 18-32.

Maxwell, S. E., & Cole, D. A. (2007). Bias in cross-sectional analyses of longitudinal mediation. *Psychological Methods*, *12*(1), 23-44.

May, T. (2011). *Social Research*. McGraw-Hill Education (UK).

McGrath, R. G. (1999). Falling forward: Real options reasoning and entrepreneurial failure. *Academy of Management Review*, *24*(1), 13-30.

McKinley, W., Latham, S., & Braun, M. (2014). Organizational decline and innovation: Turnarounds and downward spirals. *Academy of Management Review*, *39*(1), 88-110.

Mehran, H. (1995). Executive compensation structure, ownership, and firm performance. *Journal of Financial Economics*, *38*(2), 163-184.

Mellahi, K., & Wilkinson, A. (2004). Organizational failure: a critique of recent research and a proposed integrative framework. *International Journal of Management Reviews*, *5*(1), 21-41.

Merton, R. K. (1976). *Sociological Ambivalence and Other Essays.* New York: Free Press.

Merz, G. R., & Sauber, M. H. (1995). Profiles of managerial activities in small firms. *Strategic Management Journal, 16*, 551-564.

Meyers, A. D. (1982). Adopting the environmental jolts. *Administrative Science Quarterly*, *27*(4), 515-537.

Mezias, J. M., & Mezias, S. J. (2000). Resource partitioning, the founding of specialist firms, and innovation: The American feature film industry, 1912–1929. *Organization Science*, *11*(3), 306-322.

Miller, D. (1983). The correlates of entrepreneurship in three types of firms. *Management Science*, *29*(7), 770-791.

Miller, D. (2011). Miller (1983) revisited: A reflection on EO research and some suggestions for the future. *Entrepreneurship Theory and Practice, 35*(5), 873-894.

Miller, D., & Friesen, P. H. (1978). Archetypes of strategy formulation. *Management Science*, *24*(9), 921-933.

Miller, D., & Friesen, P. H. (1982). Innovation in conservative and entrepreneurial firms: Two models of strategic momentum. *Strategic Management Journal*, *3,* 1-25.

Miller, D., & Le Breton-Miller, I. (2011). Governance, social identity, and entrepreneurial orientation in closely held public companies. *Entrepreneurship Theory and Practice, 35*(5), 1051-1076.

Miller, D., & Toulouse, J. M. (1986). Chief executive personality and corporate strategy and structure in small firms. *Management Science, 32,* 1389-1409.

Miller, K. D., & Leiblein, M. J. (1996). Corporate risk-return relations: Returns variability versus downside risk. *Academy of Management Journal*, *39*(1), 91-122.

Miner, A. S., & Mezias, S. J. (1996). Ugly duckling no more: Pasts and futures of organizational learning research. *Organization Science*, *7*(1), 88-99.

Mintzberg, H. (1973). Strategy-making in three modes. *California Management Review*, *16*(2), 44-53.

Montgomery, C. A., & Wernerfelt, B. (1988). Diversification, Ricardian rents, and Tobin's q. *The Rand journal of economics*, 623-632.

Morgan, D. L. (2007). Paradigms lost and pragmatism regained. Methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research*, *1*, 48-76.

Morgan, G. (1986). *Images of Organizations.* Beverly Hills, CA: Sage.

Morgan, G., & Smircich, L. (1980). The case for qualitative research. *Academy of Management Review, 5,* 491-500.

Morgan, R. E., & Berthon, P. (2008). Market orientation, generative learning, innovation strategy and business performance inter-relationships in bioscience firms. *Journal of Management Studies*, *45*(8), 1329-1353.

Morris, M. H. (1998). *Entrepreneurial intensity: Sustainable advantages for individuals, organizations, and societies*. Westport, CT: Greenwood Publishing Group.

Morris, M. H., & Paul, G. W. (1987). The relationship between entrepreneurship and marketing in established firms. *Journal of Business Venturing*, *2*(3), 247-259.

Morris, M. H., & Sexton, D. L. (1996).The concept of entrepreneurial intensity implications for company performance. *Journal of Business Research*, *36,* 5-13.

Morris, M., Kuratko, D., & Covin, J. G. (2010). *Corporate Entrepreneurship & Innovation*. Mason, OH: South-Western CENGAGE Learning.

Mousa, F. T., & Wales, W. (2012). Founder effectiveness in leveraging entrepreneurial orientation. *Management Decision*, *50*(2), 305-324.

Mowery, D. (1981). An Emergence and Growth of Industrial Research in American Manufacturing 1899-1946, mimeo. Stanford, CA: Stanford University.

Mthanti, T., & Ojah, K. (2017). Entrepreneurial orientation (EO): Measurement and policy implications of entrepreneurship at the macroeconomic level. *Research Policy*, *46*(4), 724-739.

Mthanti, T. S., & Urban, B. (2014). Effectuation and entrepreneurial orientation in high-technology firms. *Technology analysis & strategic management*, *26*(2), 121-133.

Murphy, K. R., Myors, B., & Wolach, A. (2014). *Statistical Power Analysis: A Simple and General Model for Traditional and Modern Hypothesis Tests*. Routledge.

Naldi, L., Nordqvist, M., Sjöberg, K., & Wiklund, J. (2007). Entrepreneurial orientation, risk taking, and performance in family firms. *Family Business Review*, *20*(1), 33-47.

Naman, J. L., & Slevin, D. P. (1993). Entrepreneurship and the concept of fit: A model and empirical tests. *Strategic Management Journal*, *14*(2), 137-153.

Nelson, R. R, & Winter, S. G. (1982). *An Evolutionary Theory of Economic Change.* Cambridge, MA: Harvard University Press.

Newbert, S. L. (2007). Empirical research on the resource-based view of the firm: an assessment and suggestions for future research. *Strategic Management Journal*, *28*(2), 121-146.

Newman, I., Ridenour, C. S., Newman, C., & DeMarco, G. M. P. (2003). A typology of research purposes and its relationship to mixed methods. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 189-208). Thousand Oaks, CA: Sage.

Nickel, M. N., & Rodriguez, M. C. (2002). A review of research on the negative accounting relationship between risk and return: Bowman's paradox. *Omega*, *30*(1), 1-18.

Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*, *5*(1), 14-37.

Oakey, R., Groen, A., Cook, G. van Der Sijde, P. (2010). *New Technology-Based Firms in the New Millennium*, Vol VIII. Emerald Group Publishing Ltd.

Opler, T. C., & Titman, S. (1994). Financial distress and corporate performance. *The Journal of Finance*, *49*(3), 1015-1040.

Park, H. M. (2011). Practical guides to panel data modeling: a step-by-step analysis using stata. *Public Management and Policy Analysis Program, Graduate School of International Relations, International University of Japan*. 1-52.

Patel, P. C., Kohtamäki, M., Parida, V., & Wincent, J. (2015). Entrepreneurial orientation-as-experimentation and firm performance: The enabling role of absorptive capacity. *Strategic Management Journal*, *36*(11), 1739-1749.

Pennington, G. L., & Roese, N. J. (2003). Regulatory focus and temporal distance. *Journal of Experimental Social Psychology*, *39*(6), 563-576.

Perez Lopez, S., Manuel Montes Peón, J., & José Vazquez Ordás, C. (2005). Organizational learning as a determining factor in business performance. *The Learning Organization*, *12*(3), 227-245.

Pindado, J., Rodrigues, L., & de la Torre, C. (2008). Estimating financial distress likelihood. *Journal of Business Research*, *61*(9), 995-1003.

Pinder, C. C., & Moore, L. F. (Eds.). (2012). *Middle range theory and the study of organizations*. Springer Science & Business Media.

Ployhart, R. E., & Vandenberg, R. J. (2010). Longitudinal research: The theory, design, and analysis of change. *Journal of Management*, *36*, 94-120.

Popper, K. (2002). *Conjectures and Refutations: The Growth of Scientific Knowledge*. Routledge Classics.

Powell, W. W., Koput, K. W., & Smith-Doerr, L. (1996). Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly*, *41*, 116-145.

Prahalad, C. K., & Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review*, *68*(3), 79-91.

Priem, R. L., & Butler, J. E. (2001). Is the resource-based “view” a useful perspective for strategic management research? *Academy of Management Review*, *26*(1), 22-40.

Punch, K. F. (2013). *Introduction to Social Research: Quantitative and Qualitative Approaches*. Sage Publications, London.

Rauch, A., Wiklund, J., Lumpkin, G. T., & Frese, M. (2009). Entrepreneurial orientation and business performance: An assessment of past research and suggestions for the future. *Entrepreneurship Theory and Practice*, *33*(3), 761-778.

Remenyi, D., Williams, B., Money, A., & Swartz, E. A. (1998). *Doing Research in Business and Management*. Sage Publications, London.

Revilla, A. J., Pérez-Luño, A., & Nieto, M. J. (2016). Does family involvement in management reduce the risk of business failure? The moderating role of entrepreneurial orientation. *Family Business Review*, *29*(4), 365-379.

Roberts, P. W., & Amit, R. (2003). The dynamics of innovative activity and competitive advantage: The case of Australian retail banking, 1981 to 1995. *Organization Science*, *14*(2), 107-122.

Rosenberg, M. (1968). *The logic of survey analysis.* New York: Basic Books.

Runyan, R. C., Ge, B., Dong, B., & Swinney, J. L. (2012). Entrepreneurial orientation in cross-cultural research: Assessing measurement invariance in the construct. *Entrepreneurship Theory and Practice*, *36*(4), 819-836.

Salavou, H., & Lioukas, S. (2003). Radical product innovations in SMEs: the dominance of entrepreneurial orientation. *Creativity and Innovation Management*, *12*(2), 94-108.

Sarantakos, S. (2012). *Social Research*. Palgrave Macmillan.

Sargan, J. (1958). The estimation of economic relationships using instrumental variables. *Econometrica*, *26*(3), 393–415.

Scandura, T. A., Williams, E. A. (2000). Research methodology in management: Current practices, trends, and implications for future research. *Academy of Management Journal 43*(6), 1248-1264.

Scharfstein, D. S., & Stein, J. C. (2000). The dark side of internal capital markets: Divisional rent-seeking and inefficient investment. *The Journal of Finance*, *55*(6), 2537-2564.

Schoenfeld, D. (1982). Partial residuals for the proportional hazards regression model. *Biometrika*, *69*(1), 239-241.

Schumpeter, J. (1942). Creative destruction. *Capitalism, socialism and democracy*, New York: Harper & Row.

Senge, P. M. (1990). The Leader's New Work: Building Learning Organizations. *MIT Sloan Management Review*, *32*(1), 7-23.

Seru, A. (2014). Firm boundaries matter: Evidence from conglomerates and innovative efficiency. *Journal of Financial Economics*, *111*, 381-405.

Shahzad, A. M., Wales, W. J., Sharfman, M. P., & Stein, C. M. (2016). Casting a wider performance net: The role of entrepreneurial orientation in boosting overall firm stakeholder value. *Journal of Management & Organization*, *22*(2), 272-290.

Shane, S., & Venkataraman, S. (2001). Entrepreneurship as a field of research: A response to Zahra and Dess, Singh, and Erikson. *Academy of Management Review*, *26*(1), 13-16.

Shleifer, A., & Vishny, R. W. (1992). Liquidation values and debt capacity: A market equilibrium approach. *The Journal of Finance*, *47*(4), 1343-1366.

Short, J., Broberg, J., Cogliser, C., & Brigham, K. (2010). Construct validation using computer-aided text analysis (CATA): An illustration using entrepreneurial orientation. *Organizational Research Methods*, *13*(2), 320–347.

Shrivastava, P. (1983). A typology of organizational learning systems. *Journal of Management Studies*, *20*(1), 7-28.

Simon, H. A. (1955). A behavioral model of rational choice. *The Quarterly Journal of Economics*, *69*(1), 99-118.

Simon, H. (1957). *Models of man, social and rational: mathematical essays on rational human behaviour in a social setting*. New York: Wiley.

Simon, H. A. (1979). Rational decision making in business organizations. *The American Economic Review*, *69*(4), 493-513.

Simon, H. A. (1991). Bounded rationality and organizational learning. *Organization Science*, *2*(1), 125-134.

Singh, J. V. (1986). Performance, slack, and risk taking in organizational decision making. *Academy of Management Journal*, *29*(3), 562-585.

Sinha, T. (1994). Prospect theory and the risk return association: another look. *Journal of Economic Behavior & Organization*, *24*(2), 225-231.

Sinkula, J. M. (1994). Market information processing and organizational learning. *The Journal of Marketing*, *58*, 35-45.

Sinkula, J. M., Baker, W. E., & Noordewier, T. (1997). A framework for market-based organizational learning: Linking values, knowledge, and behavior. *Journal of the Academy of Marketing Science*, *25*(4), 305-318.

Slater, S. F., & Narver, J. C. (1995). Market Orientation and the Learning Organization. *Journal of Marketing*, *59*(3), 63-74.

Slater, S. F., & Narver, J. C. (1998). Customer-led and market-oriented: Let's not confuse the two. *Strategic Management Journal*, *19*(10), 1001-1006.

Slevin, D. P., & Terjesen, S. A. (2011). Entrepreneurial orientation: Reviewing three papers and implications for further theoretical and methodological development. *Entrepreneurship Theory and Practice*, *35*(5), 973-987.

Soininen, J., Puumalainen, K., Sjögrén, H., & Syrjä, P. (2012). The impact of global economic crisis on SMEs: Does entrepreneurial orientation matter? *Management Research Review*, *35*(10), 927-944.

Stam, W., & Elfring, T. (2008). Entrepreneurial orientation and new venture performance: The moderating role of intra-and extraindustry social capital. *Academy of Management Journal*, *51*(1), 97-111.

Stata, R. (1989). Organizational Learning-The Key to Management Innovation. *Sloan Management Review*, *30*(3), 63.

Staw, B. M., Sandelands, L. E., & Dutton, J. E. (1981). Threat rigidity effects in organizational behavior: A multilevel analysis. *Administrative Science Quarterly*, *26*(4) 501-524.

Stebbins, R. A. (2001). *Exploratory Research in the Social Sciences*. Thousand Oaks, CA: SAGE.

Stevenson, H. H., & Jarillo, J. C. (1990). A paradigm of entrepreneurship: Entrepreneurial management. *Strategic Management Journal*, *11*(5), 17-27.

Stewart, W. H., Watson, W. E., Carland, J. C., & Carland, J. W. (1999). A proclivity for entrepreneurship: A comparison of entrepreneurs, small business owners, and corporate managers. *Journal of Business Venturing*, *14*(2), 189-214.

Stockman, N. (2013). *Antipositivist theories of the sciences: critical rationalism, critical theory and scientific realism* (Vol. 3). Springer Science & Business Media.

Strauss, K., & Parker, S. K. (2018). Intervening to enhance proactivity in organizations: Improving the present or changing the future. *Journal of Management*, *44*(3), 1250-1278.

Swift, T. (2016). The perilous leap between exploration and exploitation. *Strategic Management Journal*, *37*(8), 1688-1698.

Tan, J. (2002). Culture, nation, and entrepreneurial strategic orientations: implications for an emerging economy. *Entrepreneurship: Theory and Practice*, *26*(4), 95-112.

Tang, J., Tang, Z., Marino, L. D., Zhang, Y., & Li, Q. (2008). Exploring an inverted U-shape relationship between entrepreneurial orientation and performance in Chinese ventures. *Entrepreneurship Theory and Practice*, *32*(1), 219-239.

Tarling, R. (2008). *Statistical modelling for social researchers: Principles and practice*. Routledge.

Taylor, A., & Greve, H. R. (2006). Superman or the fantastic four? Knowledge combination and experience in innovative teams. *Academy of Management Journal*, *49*(4), 723-740.

Taylor, G. R. (2005). *Integrating Quantitative and Qualitative Methods in Research*. University Press of America.

Tellis, G. J., & Golder, P. N. (1996). First to Market, First to Fail? Real Causes of Enduring Market Leadership. *Sloan Management Review*, *37*(2), 65-75.

Therneau, T. M., Grambsch, P. M., & Fleming, T. R. (1990). Martingale-based residuals for survival models. *Biometrika*, *77*(1), 147-160.

Thomke, S., Von Hippel, E., & Franke, R. (1998). Modes of experimentation: an innovation process—and competitive—variable. *Research Policy*, *27*(3), 315-332.

Thornhill, S. (2006). Knowledge, innovation and firm performance in high-and low-technology regimes. *Journal of Business Venturing*, *21*(5), 687-703.

Thornhill, S., & Amit, R. (2003). Learning about failure: Bankruptcy, firm age, and the resource-based view. *Organization Science*, *14*(5), 497-509.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*, 1124-1131.

Tversky, A., & Kahneman, D. (1991). Loss aversion in riskless choice: A reference-dependent model. *The Quarterly Journal of Economics*, *106*(4), 1039-1061.

Uotila, J., Maula, M., Keil, T., & Zahra S. (2009). Exploration, exploitation, and financial performance: Analysis of S&P 500 corporations. *Strategic Management Journal*, *30*, 221-231.

Vašková N., & Vašková, V. (2010). Breakdown of trust in financial institutions in light of the global financial crisis. *Journal of Advanced Studies in Finance*, *1*(1), 108-114.

Venkatraman, N. (1989). Strategic orientation of business enterprises: The construct, dimensionality, and measurement. *Management Science*, *35*(8), 942-962.

Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. *Academy of Management Review*, *11*, 801-814.

Vij, S., & Bedi, H. S. (2012). Relationship between entrepreneurial orientation and business performance: A review of literature. *The IUP Journal of Business Strategy*, *9*(3), 17-31.

Villalonga, B., & Amit, R. (2006). How Do Family Ownership, Control, and Management Affect Firm Value? *Journal of Financial Economics*, *80*, 385-417.

Vince, R., Sutcliffe, K., & Olivera, F. (2002). Organizational learning: new directions. *British Journal of Management*, *13*, 1-6.

Voss, Z. G., Voss, G. B., & Moorman, C. (2005). An empirical examination of the complex relationships between entrepreneurial orientation and stakeholder support. *European Journal of Marketing*, *39*(9/10), 1132 -1150.

Wagner, S., & Cockburn, I. (2010). Patents and the survival of Internet-related IPOs. *Research Policy*, *39*(2), 214-228.

Wales, W. J., Gupta, V. K., & Mousa, F. T. (2013a). Empirical research on entrepreneurial orientation: An assessment and suggestions for future research. *International Small Business Journal*, *31*(4), 357-383.

Wales, W. J., Patel, P. C., & Lumpkin, G. T. (2013b). In pursuit of greatness: CEO narcissism, entrepreneurial orientation, and firm performance variance. *Journal of Management Studies*, *50*(6), 1041-1069.

Wales, W. J., Patel, P. C., Parida, V., & Kreiser, P. M. (2013c). Nonlinear effects of entrepreneurial orientation on small firm performance: the moderating role of resource orchestration capabilities. *Strategic Entrepreneurship Journal*, *7*(2), 93-121.

Wales, W.J. (2016). Entrepreneurial orientation: A review and synthesis of promising research directions. *International Small Business Journal*, *34*(1), 3-15.

Walker, R. M. (2004). Innovation and organisational performance: Evidence and a research agenda. Advanced Institute of Management Research, London. doi:10.2139/ssrn.1306909.

Walter, A., & Auer, M., Ritter, T. (2006). The impact of network capabilities and entrepreneurial orientation on university spin-off performance. *Journal of Business Venturing*, *21*(4), 541–567.

Wiklund, J. (1999). The sustainability of the entrepreneurial orientation-performance relationship. *Entrepreneurship Theory and Practice*, *24*(1), 37–48.

Wiklund, J., & Shepherd, D. (2003). Knowledge-based resources, entrepreneurial orientation, and the performance of small and medium-sized businesses. *Strategic Management Journal*, *24*, 1307-1314.

Wiklund, J., & Shepherd, D. (2005). Entrepreneurial orientation and small business performance: a configurational approach. *Journal of Business Venturing*, *20*, 71-91.

Wiklund, J., & Shepherd, D. (2011). Where to from here? EO-as-experimentation, failure, and distribution of outcomes. *Entrepreneurship: Theory and Practice, 35,* 925-946.

Wilson, M. G. (2013). Assessing model adequacy in proportional hazards regression. In *SAS Global Forum*.

Winter, S. G. (1971). Satisficing, selection, and the innovating remnant. *The Quarterly Journal of Economics*, *85*(2), 237-261.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.

Wooldridge, J. M. (2015). *Introductory Econometrics: A Modern Approach,* 6e. Mason, OH: South-Western CENGAGE Learning.

Wright, P., Kroll, M., Pray, B., & Lado, A. (1995). Strategic orientations, competitive advantage, and business performance. *Journal of Business Research*, *33*(2), 143-151.

Yang, Z., Wang, X., & Su, C. (2006). A review of research methodologies in international business. *International Business Review, 15*(6), 601-617.

Zaefarian, G., Kadile, V., Henneberg, S. C., & Leischnig, A. (2017). Endogeneity bias in marketing research: Problem, causes and remedies. *Industrial Marketing Management*, *65*, 39-46.

Zahra, S. A. (1991). Predictors and financial outcomes of corporate entrepreneurship: An exploratory study. *Journal of Business Venturing*, *6*(4), 259-285.

Zahra, S. A. (1993). Environment, corporate entrepreneurship, and financial performance: A taxonomic approach. *Journal of Business Venturing*, *8*(4), 319-340.

Zahra, S. A. (1996). Governance, ownership, and corporate entrepreneurship: The moderating impact of industry technological opportunities. *The Academy of Management Journal*, *39*, 1713-1735.

Zahra, S. A., & Covin, J. G. (1995). Contextual influences on the corporate entrepreneurship performance relationship: A longitudinal analysis. *Journal of Business Venturing*, *10*, 43-58.

Zahra, S. A., & Garvis, D. M. (2000). International corporate entrepreneurship and firm performance: The moderating effect of international environmental hostility. *Journal of Business Venturing*, *15*, 469-492.

Zahra, S. A., Jennings, D. F., & Kuratko, D. F. (1999). The antecedents and consequences of firm-level entrepreneurship: the state of the field. *Entrepreneurship Theory & Practice*, *24*(2), 45-65.

Zahra, S. A., & Neubaum, D. O. (1998). Environmental adversity and the entrepreneurial activities of new ventures. *Journal of Developmental Entrepreneurship*, *3*(2), 123-140.

Zahra, S. A., Nielsen, A. P., & Bogner, W. C. (1999). Corporate entrepreneurship, knowledge, and competence development. *Entrepreneurship Theory and Practice*, *23*(3), 169-189.

Zahra, S. A., & Wright, M. (2011). Entrepreneurship's next act. *The Academy of Management Perspectives*, *25*(4), 67-83.

Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business Research Methods* (9th ed.). South-Western, Cengage Learning.

Appendices

Appendix A: Prominent Studies on EO throughout the Literature

Research Studies-Authors	Construct(s) examined	Sample	Method	Results
Phase 1: Conceptual Development of EO				
Khandwalla (1976/77)	Risk taking	Top managers from 103 publicly traded Canadian firms	Correlation analysis	EO was correlated with higher performance and the organisational context affected this relationship.
Miller & Friesen (1982)	Innovativeness, Risk taking (gestalt construct)	Divisional Vice presidents from 52 Canadian firms	Correlation and regression analysis run on the conservative and entrepreneurial sub-samples	Propensity of entrepreneurially oriented managers drove their firms to be more innovative and risk taking.
Miller (1983)	Innovativeness, Proactiveness, Risk taking (gestalt construct)	Divisional Vice presidents from 52 Canadian firms	Correlation and sub-group samples regression analysis	The EO dimensions differed among simple, planning, and organic firms.
Covin & Slevin (1988)	Innovativeness, Proactiveness, Risk taking (gestalt construct)	Senior managers from 80 large US firms	Moderated regression analysis and hierarchical cluster analysis	The EO and firm performance relationship was positively moderated by organisational structure (organic versus mechanistic).
Covin & Slevin (1989)	Innovativeness, Proactiveness, Risk taking (gestalt construct)	Senior managers from 161 US manufacturing Firms	Moderated regression analysis	Highly EO firms had higher performance in hostile environments, whereas conservative firms were better performers in benign environments.
Venkatraman (1989)	Proactiveness, Risk taking, Competitive aggressiveness (multi-dimensional construct)	Presidents/CEOs from 201 strategic business units of large, established firms	Regression analysis	Strategic Orientation Dimensions: Risk taking and competitive aggressiveness were negatively related to profitability of

				the firm, while proactiveness was found to be positively related to firm growth and profitability.
Covin & Slevin (1990)	Innovativeness, Proactiveness, Risk taking (gestalt construct)	Senior managers from 90 US firms	Correlation and Discriminant analysis	EO-new venture performance relationship was more positive in emerging than in mature industries.
Covin, Slevin, & Covin (1990)	Innovativeness, Proactiveness, Risk taking (gestalt construct)	Senior managers from 57 small growth seeking US manufacturing Firms	Correlation analysis	Firms operating in high-technology industries used more entrepreneurially oriented strategies than their counterparts. EO was shown to have a positive relationship with performance in firms operating in low-technology industries.
Zahra (1991)	Corporate Entrepreneurship (measured by innovativeness)	CEOs from 119 fortune 500 firms	Correlation Analysis	Corporate Entrepreneurship increased financial performance.
Covin, Slevin, & Schultz (1994)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using Covin and Slevin (1989) scale	Senior executives (CEOs/Presidents) from 91 US manufacturing firms	Moderated Regression and sub-group analysis	Positive effect of EO on firm performance was present among only firms whose strategic mission is to increase their market share.
Phase 2: Development of EO-firm performance				
Zahra & Covin (1995)	Corporate Entrepreneurship gestalt construct (Innovativeness, Risk taking) using Miller and Friesen (1982) scale	CEOs from 108 US manufacturing firms	Moderated regression analysis	Corporate-level entrepreneurship was positively related to firm performance, which increased over a 7-year period, and environmental

				hostility positively moderated this relationship.
Knight (1997)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using Covin and Slevin (1989) scale	Presidents from 258 Canadian Firms	Exploratory and confirmatory factor analysis, reliability analysis	Covin and Slevin (1989) EO scale possessed a valid, reliable, and consistent two-factor (Innovativeness and Proactiveness) structure across two cultures.
Zahra & Neubaum (1998)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using modified version of Miller (1983)	CEOs from 321 new ventures	Regression Analysis	EO was positively related to performance in high-technology but not low-technology industries.
Wiklund (1999)	Innovativeness, Risk taking (gestalt construct) utilising Miller and Friesen (1982) scale	Managing directors from 132 small Swedish firms surveyed over three consecutive years (one-year lags between measurements of EO and performance)	Regression Analysis	A positive EO-firm performance (growth and profitability combined) relationship which increased over time.
Zahra & Garvis (2000)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using modified version of Miller (1983)	CEOs from 98 US manufacturing firms	Regression Analysis	EO or international corporate entrepreneurship was positively related with performance (profitability and growth). The effect of EO on firm performance was an inverted U-shaped relationship in a hostile environment.
Lumpkin & Dess (2001)	Proactiveness, Competitive aggressiveness (multi-dimensional construct) using	Executives from 94 non-diversified, non-affiliated for-profit US firms	Factor and Regression analysis	Differential effects of proactiveness and competitive aggressiveness

	modified scale of Covin and Slevin (1989)			and they represented different constructs.
Kemelgor (2002)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using Covin and Slevin (1989)	Managers from 8 matched firms within the Netherlands and the United States.	Correlation analysis and T-tests	The EO-performance relationship was stronger and more significant in the case of US firms rather than firms in the Netherlands, and firms in the US displayed higher EO levels.
Kreiser, Marino, & Weaver (2002)	Innovativeness, Proactiveness, Risk taking, (multi-dimensional construct) using modified scale of Covin and Slevin (1989)	Owner or general managers of small medium organisations from 6 countries	Confirmatory factor analysis	EO dimensions were independent and revealed unique variance in line with Lumpkin and Dess (1996).
Wiklund & Shepherd (2003)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using Covin and Slevin (1989) scale	Managers from 384 Swedish small and medium sized Firms	Hierarchical regression analysis	EO positively moderated the relationship between a firm's ability to exploit its knowledge based resources and firm performance.
Wiklund & Shepherd (2005)	Innovativeness, Risk taking (gestalt construct) using Miller (1983) scale	Managing directors from 413 small Swedish firms surveyed over a one-year lag between predictors and dependent variable	Hierarchical regression analysis	Three-way configurational model better explained performance: strategy (EO) access to capital, and environmental dynamism.
Covin, Green, & Slevin (2006)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using Covin and Slevin (1989) scale	Senior-most executives from 110 US manufacturing firms	Regression analysis	EO was not significantly but positively related to sales growth. Three factors affect the relationship more positively: less participative decision making, emergent strategies, low proficiency of

				learning from failures.
Hughes & Morgan (2007)	Innovativeness, Proactiveness, Risk taking, Competitive aggressiveness, Autonomy (multi-dimensional construct) using Lumpkin and Dess (1996) scale	Managing directors from a sample of 211 young high-technology firms at an emerging stage of development	Multiple regression analysis	Innovativeness had a positive effect on product performance, proactiveness had a positive effect on product and customer performance, whereas risk taking had a negative effect on product performance. Competitive aggressiveness and autonomy showed no effect on firm performance.
Tang, Tang, Marino, Zhang, & Li (2008)	Innovativeness, Proactiveness Risk taking, (gestalt construct) utilising the Covin and Slevin (1989) scale	Top management teams from 185 Chinese firms	Hierarchical Regression Analysis	The relationship was indicated to be curvilinear, such that high investment in EO lead to diminishing positive returns on firm performance.
Rauch, Wiklund, Lumpkin, & Frese (2009)	Innovativeness, Proactiveness, Risk taking, Competitive aggressiveness, Autonomy (multi-dimensional and gestalt construct)	Meta-analysis of 51 studies (53 samples) using the Miller (1983) or Covin and Slevin (1989) scales or modified versions	Meta-analysis	Positive relationship between EO and firm performance, the EO-firm performance relationship was moderately large, EO represented a gestalt construct, stronger EO-firm performance relationship in the high-tech industry.
Phase 3: Maturation of EO-firm performance				
Short, Broberg, Cogliser, &	Innovativeness, Proactiveness, Risk taking, Competitive	Content analysis using computer-aided text analysis	Hierarchical regression analysis	EO had a positive effect on market-based

Brigham (2010)	aggressiveness, Autonomy (multi-dimensional and gestalt construct)	of shareholder letters on a sample of 450 S&P and a sample of 205 Russell 2000 firms from 2001-2005		performance. Innovativeness and Proactiveness had a positive impact on performance and risk taking had a negative effect on performance.
Miller & Le Breton-Miller (2011)	Objective measures of the EO dimensions: Innovativeness, Proactiveness, Risk taking (gestalt construct)	898 Fortune 1000 firms from 1996 until 2000 (263 family firms, 141 lone founders, and 492 other firms) using data from Compustat and CSRP	Panel regressions	Lone founder owners who exhibit entrepreneurial identities were correlated with higher firm-level EO and higher firm performance.
Wiklund & Shepherd (2011)	Innovativeness, Proactiveness Risk taking (gestalt construct) utilising the Covin and Slevin (1989) scale	CEOs from 239 small- and medium-sized Swedish firms in four industrial sectors (three-year lag between measures of independent and dependent variables)	Probit model, relative performance model, and T-test	Surviving firms with more EO had higher relative performance than those with lower EO. EO had a positive effect on firm failure.
Kraus, Rigtering, Hughes, & Hosman (2012)	Innovativeness, Proactiveness, Risk taking (multi-dimensional construct) using Covin and Slevin (1989) scale	CEOs from a sample of 164 SMEs in the Netherlands in 2009	Hierarchical linear regression analysis	Proactiveness positively impacted firm performance. Innovativeness improved firm performance in turbulent environments whereas risk taking negatively impacted performance in turbulence markets.
Mousa & Wales (2012)	EO gestalt construct measured objectively by summing the total number of products with	164 US firms in the high-technology industry that undergone an IPO between 2001 and 2005	Cox Proportional Hazard model	EO increases post-IPO survival. Furthermore, founder CEOs positively moderated the EO-survival

	the total number of risk factors			relationship.
Kreiser, Marino, Kuratko, & Weaver (2013)	Innovativeness, Proactiveness, Risk taking (multi-dimensional) utilising Covin and Slevin (1989) scale	Owners/general manager of 1,668 small- and medium- sized enterprises (SMEs) in nine countries in 13 different industries	Hierarchical regression analysis	Innovativeness and Proactiveness had a positive U-shaped relationship with performance whereas risk taking had a negative U-shaped relationship with performance.
Rosenbusch, Rauch, & Bausch (2013)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using Miller (1983) and Covin and Slevin (1989) scales	Meta-analysis of studies that focus on the EO-performance link and the relationship between EO and environmental variables as well as the relationship between environmental variables and performance.	Meta-analysis and structural equation modelling	EO had a positive effect on firm performance relationship. EO mediated the relationship between environmental munificence, dynamism, and hostility and firm performance.
Wales, Patel & Lumpkin (2013b)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using Covin and Slevin (1989)	CEOs from 173 High-technology Manufacturing small and young firms in the US states from Corptech directory	Path analysis based on bootstrap standard errors	Higher levels of CEO narcissism was positively related with higher EO. Partial mediation of EO on CEO narcissism and performance variance.
Wales, Patel, Parida, & Kreiser (2013c)	Innovativeness, Proactiveness, Risk taking (gestalt construct) utilising Covin and Slevin (1989)	CEOS from 258 Swedish small firms	Hierarchical OLS regression	Inverted U-shaped relationship was found between EO and small firm performance.
Dai, Maksimov, Gilbert, & Fernhaber (2014)	Innovativeness, Proactiveness, Risk taking (multi-dimensional construct) utilising modified version of Covin and	Owners or chief executives from 500 SMEs in 10 industries	Regression analysis	Relationship between innovativeness and proactiveness and international scope was U-shaped, and the relationship

	Slevin (1989) scale			between risk taking and international scope was inverse-U shaped.
Engelen, Kube, Schmidt, & Flatten (2014)	Innovativeness, Proactiveness, Risk taking (gestalt construct) utlising Covin and Slevin (1989) scale	CEOs and members of the TMT from 219 SMEs in Germany	Stepwise Regression analysis	EO-firm performance relationship was positive. A firm's absorptive capacity positively moderated the relationship between EO and firm performance in the presence of turbulent markets.
Lechner & Gudmundsson (2014)	Innovativeness, Proactiveness, Risk taking, Autonomy, Competitive aggressiveness (multi-dimensional construct) using Lumpkin and Dess (1996)	Managers of 335 Small Icelandic firms	PLS path modelling	Innovativeness had a positive effect on performance. Risk taking and Competitive aggressiveness had a negative effect on performance. Proactiveness and autonomy had no significant effect.
Engelen, Neumann, & Schwens (2015)	Innovativeness, Proactiveness, Risk taking (gestalt construct) measured using Short et al. (2010) CATA method	142 observations from 61 companies in the high-tech setting from 2005 to 2007 from Execucomp	Generalized estimated equation regression analysis	The relationship between CEO overconfidence and EO was moderated by market dynamism, with CEO overconfidence effect on EO being stronger at higher levels of market dynamism. CEO overconfidence's effect on EO was increasing at a decreasing

				rate.
Gupta & Gupta (2015)	Innovativeness, Proactiveness, Risk taking (gestalt construct) measured using a historiometric approach	Large, publicly traded 42 German firms listed in the Forbes 2010 ranking over 10-year panel data from year 1999 until 2008	Regression Analysis Fixed effects	The positive effect of EO became less significant over time and the external environmental factors impacted the superior effect of EO on a firm's performance over a 10-year span.
Patel, Kohtamäki, Parida, & Wincent, (2015)	Innovativeness, Proactiveness, Risk taking (gestalt construct) was measured by modified scales by Covin and Slevin (1989) and Lumpkin and Dess (2001)	Managers from 147 small young firms in the AffarsData directory in high-technology industry during 2007 and 2009.	Structural equation modeling (Path analysis)	EO and Potential absorptive capacity increased the variation in innovation outcomes, but the realized absorptive capacity lead to financial returns from EO.
Gupta, Mortal, & Yang (2016)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using CATA method of shareholder letters for measuring EO (Short et al., 2010)	243 large firms on the Forbes 2000 list from five countries: Australia, Canada, Germany, United Kingdom, and United States from 2005 until 2008	Regression analysis	The positive impact of EO on the stock-market value of firms was contingent on the organisational and industrial discretion.
Karmann, Mauer, Flatten, & Brettel (2016)	Innovativeness, Proactiveness, Risk taking (multi-dimensional and gestalt construct) using Covin and Slevin (1989) scale	CEOs of 411 firms in Germany during 2012	Binary logistic regression analysis	Innovativeness decreases corrupt behaviours. Risk taking increases corrupt behaviours. EO insignificant effect on corruption.
Lomberg, Urbig, Stöckmann, Marino, & Dickson (2017)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using Miller	Top managers from 1,024 small- and medium-sized firms from six countries: Australia,	Hierarchical ordinary least squares regression and communality analysis	Only proactiveness, from the EO dimensions, had a unique effect on firm

	(1983)/Covin and Slevin (1989) scale	Finland, Mexico, Netherlands, Norway, and Sweden.		performance. There was also a strong bilateral shared effect between innovativeness and proactiveness.
Revilla, Pérez-Luño, & Nieto (2016)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using Covin and Slevin (1989) scale	Managers from Spanish firms in five medium- and high-manufacturing industries from 2007 until 2013	Cox Proportional Hazard regression	Family involvement decreases the risk of business failure, but EO positively moderates the relationship between family involvement and risk of failure.
Shahzad, Wales, Sharfman & Stein (2016)	Objective measures for the EO dimensions: Innovativeness, Proactiveness, Risk taking (multi-dimensional construct)	The Kinder, Lydenburg, and Domini (KLD) database for shareholder data from 2005 until 2008, Compustat for financial data, and EO data from secondary sources from 2004 until 2007 for a sample of 1,015 public US firms	Random-effects panel regression	Innovativeness and Proactiveness have a positive effect on shareholder value. Risk taking has a negative effect on shareholder value.
Eshima & Anderson (2017)	Innovativeness, Proactiveness, Risk taking (gestalt construct) using Covin and Slevin (1989) and Anderson et al. (2015) scale	Most senior executives of 535 small to medium-sized South Korean firms and executives of 107 small to medium-sized firms in the UK	Confirmatory factor analysis	Reciprocal relationship of growth and EO relationship with growth being a predictor of EO and adaptive capability mediates the relationship between growth and EO.
Mthanti & Ojah (2017)	EO (gestalt construct of dimensions innovativeness, proactiveness, risk taking) measured at the macro-level by secondary data	93 countries from CANA (Castellacci & Natera, 2011) and WDI (World Bank's Development Indicators) databases from 1980 to 2008	System-GMM analysis	EO at the macro-economic level has a positive impact on economic growth.

Appendix B: Technical Issues in Dataset Construction

Compustat and CRSP databases are merged to compute EO and firm performance variables as well as relevant control variables. Through using SAS, I first merged Compustat and CRSP datasets. Both Compustat and CRSP have unique firm identifiers. Thus, merging the two datasets is done through the company's unique identifier and not through the company's name. In CRSP, each firm is identified by a unique firm identifier (PERMCO) whereas the security stock file is identified by the identifier, PERMNO. In Compustat, each firm is identified by a unique firm identifier (GVKEY). For merging Compustat and CRSP, it can be done through CUSIP method by matching either CUSIP at security level or at the firm level. At the security level, PERMNO (in CRSP) is matched to GVKEY (in Compustat) and the CUSIP in CRSP (8-digit CUSIP) is matched to CUSIP in Compustat (CNUM, first 6 digits of CUSIP) and CIC (two-digit CUSIP issue number). At the firm level, PERMCO (in CRSP) is matched to GVKEY (in Compustat) and CUSIP in CRSP (first 6 digits of CUSIP) is matched to CUSIP in Compustat (CNUM). According to WRDS, by matching using CUSIP firm identifier, about 80% of PERMCO in CRSP is matched to GVKEY in Compustat. Thereby, about 20 % are unmatched cases (specifically about 80% of GVKEY in Compustat is matched to PERMCO in CRSP and 81 % of cases of PERMCO in CRSP is matched to GVKEY in Compustat).

To match Compustat and CRSP, the CCM (Compustat-CRSP merge) method was used. The CCM method involves using the merged Compustat/CRSP link file from WRDS to merge Compustat with CRSP. Using the CCM method increases the matching percentage to more than 80 % (specifically about 87% of cases of GVKEY in Compustat is matched to PERMCO in CRSP and about 84 % of PERMCO in CRSP is matched to GVKEY in Compustat). First, monthly CRSP file was adjusted to have beginning and end fiscal year dates. Compustat data is in fiscal years, so to merge with the link table a file was created based on calendar dates and in specific the beginning and end dates for the fiscal years. According to WRDS, then Compustat-link table was merged with the CRSP monthly file based on the beginning and end fiscal year dates. Thus, Compustat and CRSP were merged based on fiscal year end. The CCM method is clearly outlined in the WRDS website. To make sure that firms included are those that are publicly traded, the merged file of Compustat and CRSP only included firms with CRSP share codes of 10 or 11.

Furthermore, the header exchange code from CRSP monthly stock file is coded 1, 2 or 3 to indicate whether the firm's securities are in NYSE, AMEX, and Nasdaq respectively. This means that only firms that are publicly traded were included. Moreover FIC, foreign incorporation code, which indicates the country the company was incorporated in, should be USA to include only US firms (Hoberg & Parabhala, 2009). After all the Study's calculations of the included variables, only firms that are in the technology industry are chosen from the overall sample for the analysis. The appropriate method for merging was used to make sure that matching of firms is done properly. This step dictates the firm pool that was used.

Appendix C: Data Items used from the Databases

The data items here were used in the computations of the variables of interest.

1. Data items used from Compustat North America Fundamentals Annual

The following data items from Compustat were collected to compute the variables. The data items that were used from Compustat are: company name (CONM), firm identifier (GVKEY), end of the fiscal year (FYR), fiscal year of the current fiscal-year end month (FYEAR), historical SIC (SICH), foreign incorporation code (FIC), NCUSIP (historical CUSIP firm identifier), CUSIP (firm identifier), research and development expense (XRD), retained earnings (RE), gross sales (SALE), common shares outstanding (CSHO), price close- annual calendar year (PRCC_C), price close- annual fiscal year (PRCC_F), liabilities (LT), total current liabilities (LCT), total current assets (ACT), total long-term debt (DLTT), total debt in current liabilities (DLC), preferred stock liquidating value (PSTKL), total assets (AT), capital expenditure (CAPX), property, plant, and equipment (PPENT), total long term debt (DLTT), total debt in current liabilities (DLC), number of employees (EMP), income before extraordinary items (IB), cash and short term investment (CHE), earnings before income and tax (EBIT), working capital (WCAP), research company deletion date (DLDTE), research company reason for deletion (DLRSN), status alert (STALT).

2. CRSP

The monthly stock file from CRSP was used to merge with Compustat whereas the daily stock file was used to measure the risk taking, dimension of EO.

Appendix D: STATA commands

	STATA commands
Panel Data setup	xtset gvkey fyear
Linearity testing	nlcheck
Multicollinearity test: VIF	regress, VIF
Correlation of coefficients	estat vce, corr
Heteroscedasticity test	xttest3
Autocorrelation test	Xtserial
Residual generation	Predict res, e
Graphic distribution of residuals	kdensity res, normal
Winsorization	winssor2 x, suffix(_w) cuts (1 99)
Standardisation	egen x_std=std(x)
LM test	xttest0
Hausman test	est store fe est store re hausman fe re, sigmamore
Robust Hausman test	Xtoverid
Time effect test	Testparm
Generation of time dummies	tabulate fyear, generate(dum)
Descriptive statistics	summarize x, detail
Adjusted R-squared	display "adjusted R2 = " e(r2_a)
Robust clustered errors	vce(robust) or vce(cluster gvkey)
Bootstrapped errors	vce(bootstrap, reps(500)) cluster(gvkey)
Scatterplot of residuals	scatter res x
Scatterplot of quadratic relationship	graph twoway qfit y x|| scatter y x twoway function y_variable_name = _b[_cons] +_b[x_variable_name]*x + _b[x_variable_name]*x^²
High tech dummy statistics	univar x, by(dummy high tech variables)
Mean centering	summarize x, meanonly gen centered_x = x - r(mean)
u-test	utest x x_square, fieller level (90)
Fixed effect panel regression	xtreg y x, fe
Marginsplot of EO	margins, at(eo=(10(5)-10)) marginsplot
Sargan-Hansen Endogeneity test	Xtivreg2
Academic tables	Esttab

Appendix E: SAS commands

	SAS commands
Estimation of the Cox partial likelihood method	Proc PHREG Ties=Efron
Estimation of the survivor functions using the Kaplan-Meier method	Proc Lifetest Options: 'CL' option shows the 95% confidence interval limits around the survivor functions. 'At risk' option 'STRATA' option shows the comparison of the survival functions of two groups
Robustness of Cox regression results	Option: 'COVSANDWICH' is used in 'Proc PHREG', which accounts for the dependence of the observations Option: 'STRATA' to stratify the firms based on their sub-industry
Generation of low, high of main predictor variables	Proc rank
Proportionality and linearity testing	Proc Loess
Generation of Schoenfeld residuals	Ressch
Generation of martingale residuals	Resmart